..THE IRON AGE..

NEW YORK, MARCH 31, 1932

ESTABLISHED 1855

Vol. 129, No. 13

"Normal" Cost —A Key to Stable Overhead Charges

IT is a common complaint that overhead is high in dull times and low in boom times. Yet prices cannot follow the sharp up and down swings of overhead expenditures. The way out, the author states, is to establish a "normal" basis for charging overhead into costs.

The first step is to determine "normal" plant operations—an average for a representative number of years—and then to ascertain the "normal" overhead charge. Applying this charge in flush times will result in building up an overhead reserve in excess of normal requirements. Applying it in dull periods will result in overhead deficits which will be deducted from the reserve.

Overhead expenses, Mr. Frank states, should not include the cost of carrying excess capacity.

By THOMAS B. FRANK

Treasurer, Cincinnati Planer Co., Cincinnati

DURING times of business depression we are continually confronted by the time-honored axiom that "now is the time to put our house in order." Products are redesigned, organizations revamped, production methods changed to conform to new ideas of manufacturing; all of which are done under the stress of increasing necessity to reduce cost and the general expense of doing business. Growing competition in most lines, and decreasing price trends, make such a course imperative.

New methods which make for greater efficiency and accuracy should also be adopted in the cost department. After all is said and done, "cost" is fundamental, and should accordingly be given careful study, not only by the accountant, but by the business executives as well. The cost accountant's function is to translate the results of executive policy into costs of doing business in its major activities—manufacturing and selling. That is why I should like to see the study of costs broadened out to the point where responsible executives make it a part of their job to know all elements of their business that contribute to cost and the manner in which those elements affect cost.

The curve of business activity, the business cycle, never was a straight line. Just as sure as it goes up, it is as sure to come down. Periods of prosperity and depression will always recur, if we are to be guided by past experience. The intensity of these movements depends entirely upon our actions. If we expand and overproduce during good times, then follows the depression or falling off of business. If we curtail to the limit, cut wages, and do various and sundry things that we all do during depressions, we help prolong the period of poor business. At the same time such activities contribute toward the restoration of better times.

Every business man knows that his costs are subject to fluctuations in much the same manner. What all of us are striving for is a happy medium or normal, that will assure us of a more or less known production. So

long as human beings think and act as they always have, we will, no doubt, continue to have changing periods of business activity. In the matter of costs, a different viewpoint has been established. For costs may be based on so-called "normals" of plant operation.

What Is Normal Plant Operation?

Somewhere between the feverish peak production of boom times and the doldrums of a stagnant operation in times of depression, there is a level of activity that may be called normal. Each business, of course, will have to determine where that point is. Past experience is about the best guide that most businesses will have, giving consideration to the increasing population, potential markets for the products, new inventions and the like.

Let us take a specific example and follow through. A study of the machine tool industry for a number of years has shown the normal business of that industry to be about 60 per cent of capacity. By working overtime, production in boom times may be over the 100 per cent of capacity, while during dull times it may fall to 20 per cent. However, the study referred to has shown definitely that the normal is around 60 per cent. In other words, machine tool plants, over a period of years, may expect to reach a production amounting to only 60 per cent of their plant capacity. Other industries, no doubt, have made similar studies which show like conditions. Therefore, the complete business cycle must be considered in establishing costs that are to be of any value, not only for comparative purposes but for current use as well.

Normal Cost Should Be Based on Normal Activity

I have heard many business men complain that their overhead was extremely high during dull times, and the opposite during boom times. It is true that actual outlay for overhead expenses may be high or low in ratio to the total amount of business transacted. However, for the purposes of costing production it seems to me that a normal cost should be used based upon the normal activity to be expected in that business over the period of the business cycle as it applies to the particular business or industry.

ILLUSTRATION NO. 1—COMPARISON OF DEPRECIATION EXPENSE

Year	Monthly Depreciation	Normal Hourly Rate	Actual Hours Worked	Applied to Cost	"Over" Applied	"Under" Applied	Balance
1927.....	$100.00	$0.83	200	$166.00	$66.00	....	$66.00
1928.....	100.00	0.83	140	116.20	16.20	....	82.20
1929.....	100.00	0.83	100	83.00	....	$17.00	65.20
1930.....	100.00	0.83	125	104.75	4.75	....	69.95
1931.....	100.00	0.83	59	41.50	....	58.50	11.45

Prices Cannot Follow Rise in Overhead

Certainly no sound sales policy could be established on a basis of cost under such varying conditions. Price surely could not follow the sharp up and down trend of overhead expenditures. Prices must be maintained at a consistent level, subject to market fluctuations that in no way have any relation to the amounts necessary to expend for overhead. Every business has its individual overhead problems, which in total must be returned through the medium of selling prices. This fact alone makes it necessary to establish a normal basis for charging overhead into costs.

The 48-hr. week is considered to be about standard in most manufacturing plants. A year of 50 weeks, which eliminates holidays, etc., makes a total of 2400 hr. at capacity operation, or 200 hr. per month, for each employee or each productive machine. At the normal capacity of 60 per cent the monthly hours would be 120.

For example, let us take the charge for depreciation, which, like taxes, interest and insurance, remains the same regardless of the productive hours operated by the plant. Assume the monthly depreciation for one specific machine be $100. This charge divided by the normal hours of its operation would result in a monthly charge of 83c. to overhead. If this overhead charge were computed on the basis of the capacity operation of 200 hr. per month, the charge would be 50c. an hour. On the 20 per cent of capacity basis it would be $2.50 an hour. It should be quite obvious that rates for the varying capacities would only result in distorted cost figures when such rates were used for overhead charges. The normal rate of 83c. establishes a medium of comparison as well as a more reasonable charge over the business cycle.

How All Items of Overhead Should Be Computed

Illustration No. 1 shows a tabulation of a single month's depreciation covering five different years. The first year indicates a capacity operation of the machine, absorbing $166 of depreciation expense. The other years show varying amounts absorbed according to the hours operated. The "over" and "under" absorbed amounts will be seen to about balance for the five-year period.

The usual custom in accounting has been to charge off all over or under applied overhead at the end of each year. This procedure is correct for most financial purposes and for income tax purposes. However, for the purpose of maintaining an accurate check upon this variation over a period of years I feel that a reserve should be set up on the cost records for recording these variations as a continuing account. The results over the period of the business cycle would furnish valuable information which would give a fairly accurate check upon the determination of the plant's normal capacity.

Costs including overhead charges based on normals for all items of expense would be consistent over a period of time, and would be maintained on an even keel, subject only to changes in the cost of direct labor and material, and the changes in methods and physical plant, insofar as these changes affect cost.

The executive armed with cost figures computed on this basis is in a position at all times, good, bad and indifferent, to act intelligently, knowing that such costs are consistent with actual plant operations over a period of years. Periodic statements

ILLUSTRATION NO. 2—DIVISION OF EXPENSES

Expense	Total Expense	Productive Plant	Excess Capacity
Building depreciation	$2,000.00	$1,800.00	$200.00
Interest	6,000.00	5,400.00	600.00
Taxes	1,500.00	1,350.00	150.00
Insurance	350.00	315.00	35.00
Rent	1,000.00	1,000.00	.....
Heat	1,000.00	900.00	100.00
Watchman service	1,400.00	1,315.00	85.00
Total expense	$13,250.00		
Charge to cost		$12,080.00	
Charge to profit and loss			$1,170.00

of the over and under absorbed overhead give him a definite picture of plant operations. He is then in a position to formulate company policies and take action toward keeping the plant production up to normal.

"Necessary" Capacity and "Excess" Capacity

In determining normal overhead rates the plant should be separated into two classifications — necessary capacity and excess capacity. In most every plant there are items of equipment and areas of floor space that are not actually needed in the normal production of the plant, or even at capacity. This excess capacity may have come about as a result of overexpansion, change of manufacturing methods and other causes. The cost of carrying and maintaining such excess capacity is not an element of cost of production. All overhead expenses should be carefully analyzed and those pertaining to such excess capacity separated and charged to a profit and loss account for "Cost of Excess Capacity." Expenses incident to such excess capacity have nothing whatever to do with current production and should never be charged to cost of production through overhead accounts.

Such expenses usually are building depreciation, taxes, insurance, interest, heat, and certain classes of indirect labor necessary to protect and maintain such excess buildings and equipment. In setting up the overhead expenses these items should be classified and divided as between the productive and excess capacities, as shown in Illustration No. 2, based upon the best information available regarding the portion of the expense applicable to the two classifications. In the illustration, 10 per cent of the plant capacity is considered as excess capacity. Therefore 10 per cent of the fixed charges are applied accordingly. The item of rent applies to the productive or necessary plant only, and the watchman service is applied on the basis of the actual time he spends in the excess departments, etc. Other expenses should be divided in the same manner. The costs pertaining to the productive plant are charged to costs through the burden account, and the charges accruing from excess capacity are charged directly to profit and loss.

I strongly recommend that the excess capacity cost be shown as a separate item on the profit and loss statement, where it will be seen by the managing executive of the business. It brings forcibly to his attention the burden the business is shouldering by having the excess capacity and it should stimulate his efforts in the direction of finding something whereby the unused plant may be utilized and the loss transformed into a profit.

Beryllium Adds Strength to Copper

THAT beryllium when alloyed with copper has decidedly beneficial effects was demonstrated in a paper "Copper-Beryllium 'Bronzes'" at one of the sessions of the Institute of Metals division of the American Institute of Mining and Metallurgical Engineers at its general February meeting in New York. The author was J. Kent Smith, consulting metallurgist, Beryllium Development Corpn., New York. His paper presents the results of an investigation to ascertain the effect of varying percentages of beryllium on pure copper and the properties of the resultant alloys in their softest condition, the effect of heat-hardening on them, and the extent to which these properties could be augmented by different combinations of heat-hardening and cold-rolling.

In cold-rolled strip containing 0.34 to 2.75 per cent Be, tensile strengths from 74,900 lb. to 156,000 lb. per sq. in. were obtained after a 50 per cent reduction, with values up to about 200,000 lb. after reductions of 75 and 90 per cent. Similar high tensile strengths were obtained after heat-hardening the cold-rolled strips.

Mr. Smith states that beryllium-copper in the form of a master alloy containing 12 to 15 per cent metallic beryllium and the remainder copper, and of a specific gravity approximating 6.0 is now available both for commercial and further experimental work. In using this alloy to prepare the various beryllium bronzes, the procedure is simple, he says, being about as follows:

The copper charge is dead-melted under a simple flux and covering of charcoal, according to the shop practice of the user. The bath of molten metal is then superheated about 200 deg. F. above pouring temperature, the broken master alloy added and quickly stirred in with a graphite, plumbago or other suitable stirring rod, taking care that the alloy is not left floating in the top of the crucible and thus exposed to the furnace atmosphere. The whole is then allowed to come—either by heating or by further cooling as the case may be—to the pouring temperature proper for molten copper, and subsequent casting operations are performed as usual.

Particular care should be taken that in the subsequent fabrication of the alloy the temperature is never allowed to exceed 1475 deg. F. in commercial or other practice as otherwise the metal will "burn" and the proper results will not be obtained in the "precipitation hardened" article.

MACHINING THE BUICK CAMSHAFT

By BURNHAM FINNEY
Detroit Editor, The Iron Age

MANUFACTURE of the camshafts for Buick automobiles, done at the Flint, Mich., plant of the Buick Motor Co., comprises a number of interesting machining operations and careful heat treatment of the work in process. These operations are outlined in sequence in the following paragraphs.

As the camshaft enters the machine department, it is milled to length on a continuous miller and both ends are centered on a General Motors centering machine. Then the camshaft is straightened to within 1/32 in. on an 8-ton flexible power press.

The outside diameter of the gear for the steady rest is spot ground on a 10 in. x 36 in. grinding machine. From this point the camshaft goes to a Multi-Cut lathe on which the right bearing is turned and chamfered. There follows a turning operation between the cams and gear diameter on an automatic lathe. A ⅝ x 18-in. thread hole then is drilled, tapped and countersunk in the camshaft by means of a 24-in. drill press.

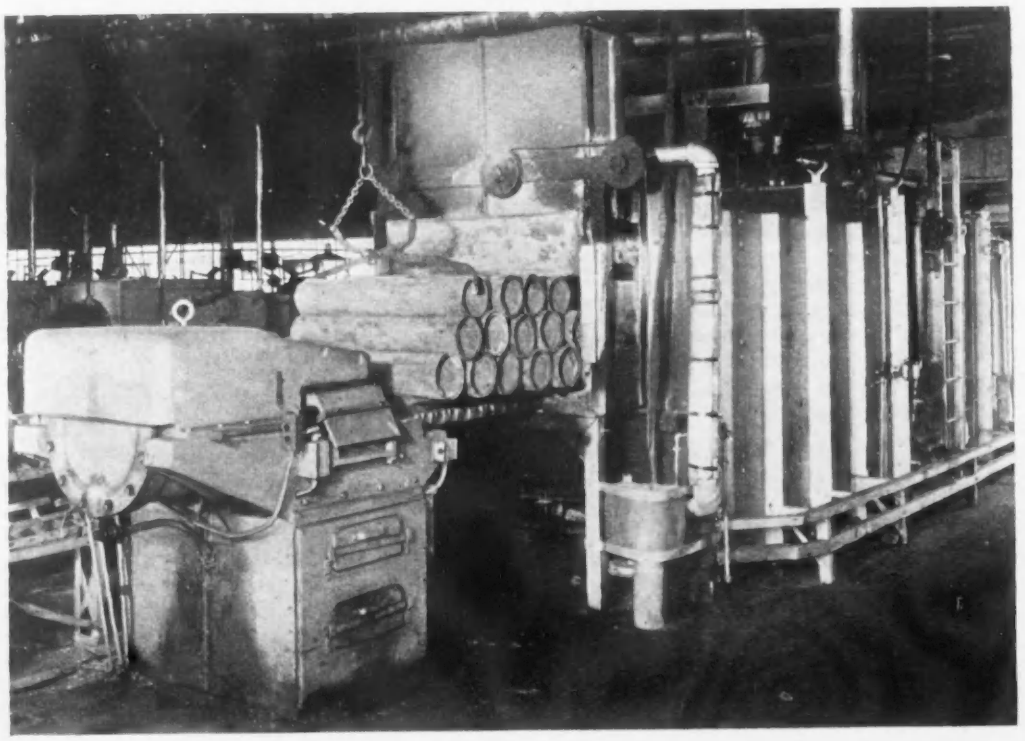
Before further work is done on the camshaft, it is straightened again, this time to within 0.008 in. The next machining operation is spot grinding the O.P.D. gear for the steady rest. The cam gear bearing is finish turned on an 18-in. lathe, with a special tool block to support the camshaft. Both ends of the camshaft are recentered on a single-spindle drill press.

The keyway is cut in the gear bearing for the driver with a No. 2 hand miller. At this point the camshaft is run through a washing machine, dipped in muriatic acid and rinsed in cold running water prior to passing through a variable-speed plating machine where it is copper-plated. After the camshaft is copper-plated, it goes to an 18-in. lathe, equipped with a special saddle, on which the bearings are finish turned.

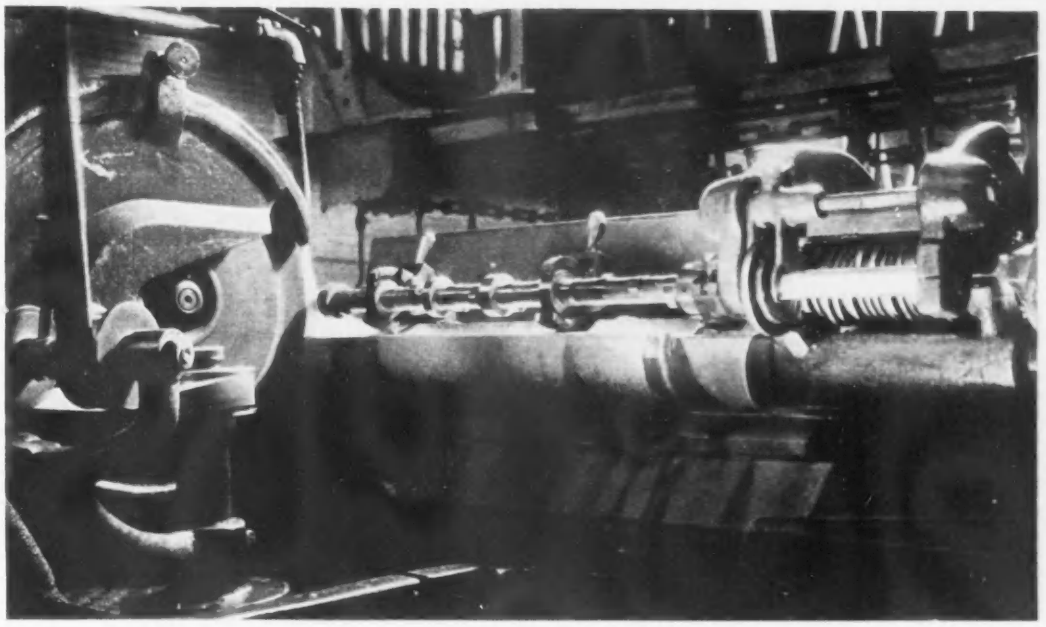
Continuous Type Carburizing Furnace Employed

The cams and eccentric are rough and finish turned on a cam lathe. Following this operation, camshafts are loaded on skids and packed in tubes for carburizing. The tubes are cut from 8 in. steel pipe and are 41 in. long, each one holding seven camshafts. By means of an overhead crane the tubes are placed in the charging end of an automatic continuous camshaft carburizing furnace in which camshafts are hardened all over, with the exception of the gear end. They are heated to a temperature of 1440 to 1450 deg. F. and quenched in a brine solution at the end of the furnace. They are tempered in a gas-fired draw furnace at 375 deg. The oil pump gear blank is annealed in a gas-fired annealing furnace, after which the camshafts are tested for hardness and clean holes.

Both ends of the camshaft are recentered on a 14-in. two-spindle drill press served by a heavy-duty roller conveyor. The drill press is equipped with a special tool for the recentering work. A third straightening operation follows, the camshaft being straightened to 0.008 in. on an 8-ton flexible power press. Here the camshaft is inspected.



CAMSHAFTS are put through a continuous carburizing furnace in steel tubes 41 in. long, each of which holds seven camshafts.



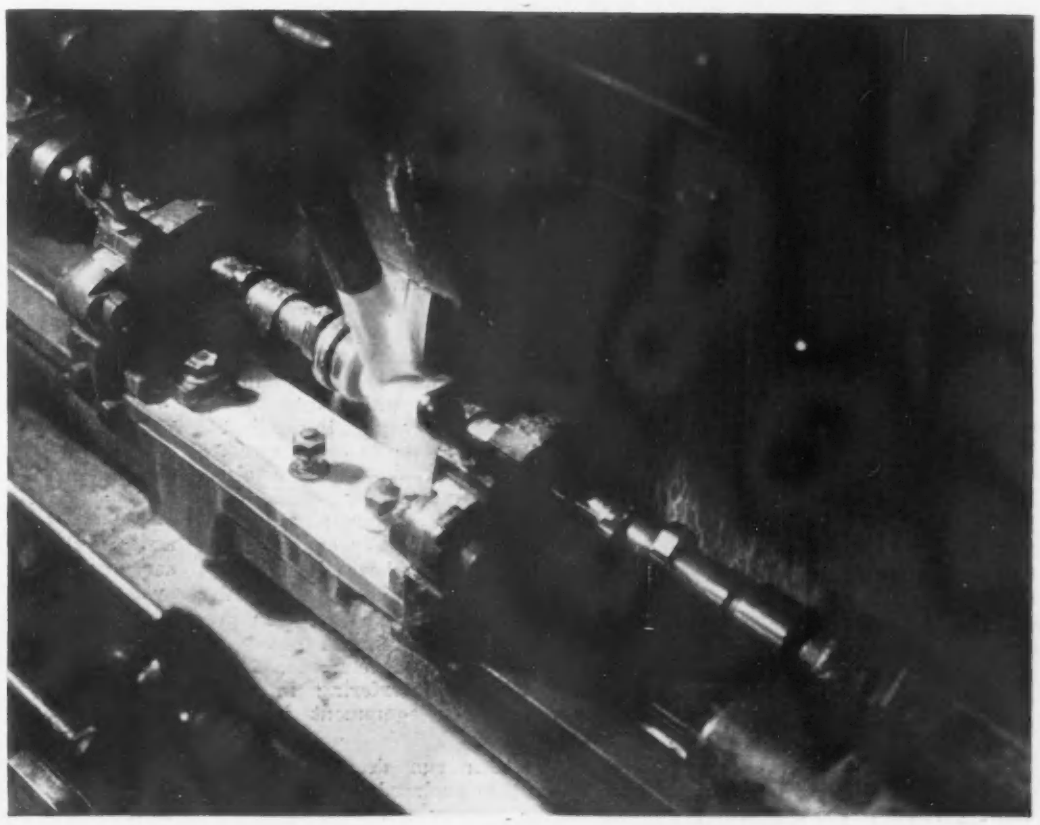
ROUGH grinding of cams on a cam grinder.

Each individual bearing on the camshaft is rough and finish ground on a battery of grinding machines. The gear pilot is rough ground and the front main bearing rough and finish ground on these machines. The outside diameter of the gear then is finish turned on a lathe and No. 9 keyway in the gear pilot is cut on a plain, knee-type milling machine. The cams and eccentric are rough ground on a group of cam grinders, after which the front and center bearings are straightened to 0.002 in. in a straightening press. Inspection of the camshaft follows.

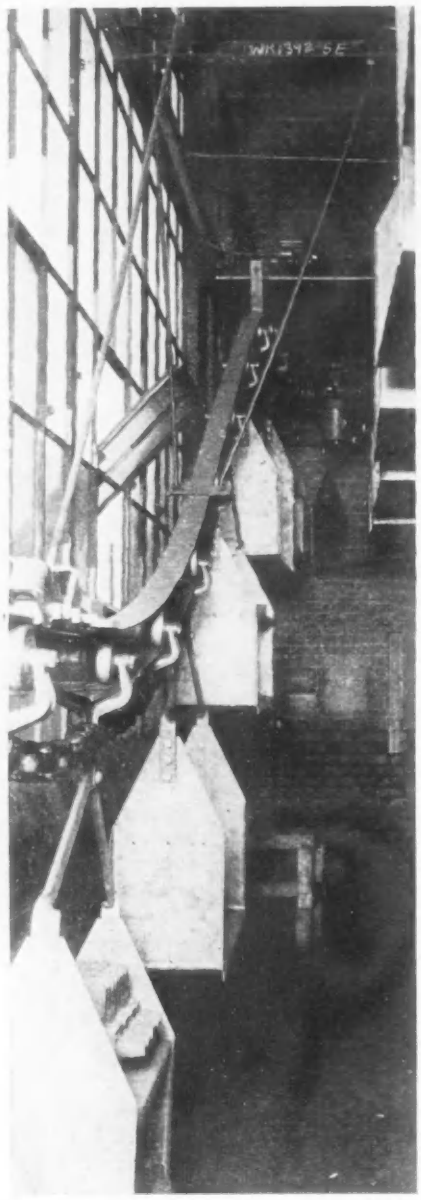
Cams and the eccentric on the camshaft are finish ground on a battery of five hydraulic cam grinders, each of which turns out four complete camshafts an hour. Then the front main bearing is semi-finish ground on a 10 in. x 36 in. grinder and finish ground on a similar machine. The cam gear pilot also is finish ground in the same manner. After the oil pump gear is cut, the camshaft is conveyed through a washing machine.

Burrs are filed from the edges of the gear on a 10-in. speed lathe; however, burrs from the top and end of the gear are filed off by hand. A diamond floor grinder is used to brush off all loose metal. Burrs are filed from the cams and front bearing on a 10-in. speed lathe; following this a $\frac{5}{8}$-in. hole is hand-tapped in the camshaft.

The final operation is thoroughly checking the camshaft by means of a comparator, with a special fixture for testing the shaft.



FINISH grinding of cams on a hydraulic cam grinder.



THIS conveyor travels up and down various gradients and makes short turns with freedom from jerks and vibration.

CORE CONVEYOR PROMOTES ECONOMY

COORDINATION of conveyor speed to core setters' requirements, elimination of annoyance and lost time resulting from core racks being spotted inconveniently or moved, and assembly of all the cores needed for an engine block are outstanding features of a conveyor recently installed by the Link-Belt Company for the American Foundry Co., Indianapolis, Ind. This conveyor passes from one building to another, affording head clearance where practicable and it dips to working levels at loading and unloading stations. Its installation conserves much floor space formerly needed for core trucks.

By THORPE E. WRIGHT, M.E.
Link-Belt Co.
Indianapolis.

PREVIOUS to the time this new unit was installed conveyors were used throughout the plant, except for handling cores. At that time cores were brought to the molders in racks of conventional type by means of a powered lift truck. The core building is separated from the main foundry unit by an inclosed passageway.

Core makers are stationed along the end wall of the building and along a part of the sidewall. The trolley conveyor is so located that it not only receives the finished work of these core makers but also passes in front of storage racks which contain the smaller cores, making it possible to place upon two consecutive trays all of the cores required to make up one engine block, including the large cores for forming the cylinders and the inner portion of the crankcase.

Large cores are placed on end, side by side. This trolley conveyor is 700 ft. long. The ability of a conveyor of this length to handle the tall cores was questioned because of anticipated pulsation in a conveyor of this length and the inertia forces of turning the loaded trays around the several sprockets. Operation, however, has been so smooth that no cylinder core has been tipped. The conveyor has practically eliminated damage to finished cores and from that one standpoint justifies its installation.

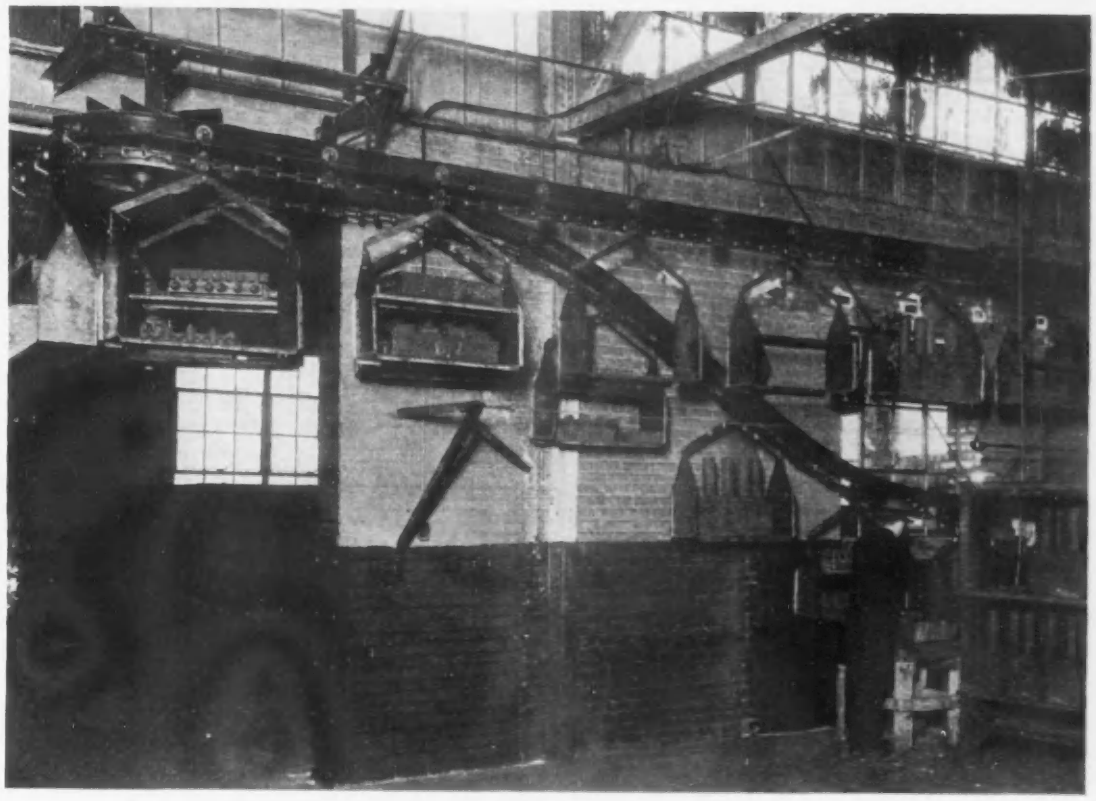
After passing the coremaker's benches the conveyor travels upward to the maximum elevation permissible in passing through the inclosed passageway to the main foundry building. There a second upward turn is made and the conveyor passes horizontally around a stairway to permit its traveling parallel to the building wall, in a location which interferes with no foundry operation, to the first point where cores are to be removed. At this point the conveyor drops to a convenient elevation for unloading and travels horizontally along the building wall, to the far end of the foundry building, where it passes over an upward vertical curve and around a pair of sprockets, which so locate the return run of the conveyor that it passes back through the roof trusses without interfering in any way with other equipment in the plant.

This return run drops, to pass through the enclosed areaway between the foundry and the core building, and at this elevation passes around the core room to the drive, after which the conveyor drops to a convenient location for receiving material from the storage racks and coremakers as previously outlined. The drive consists of a variable speed transmission with hand chain for controlling the speed at which the conveyor operates.

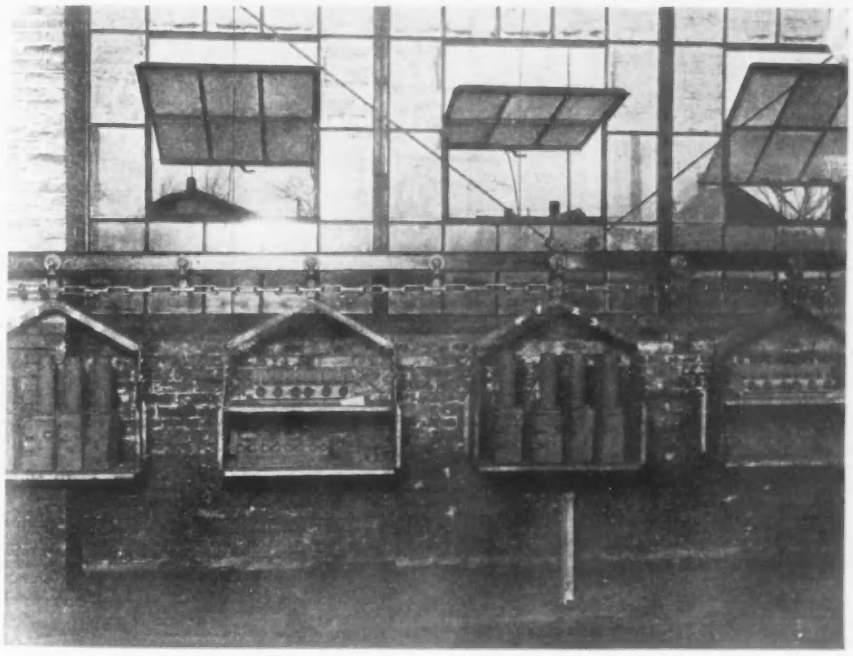
No difficulty has been experienced in coordinating the speed of the conveyor with the requirements of the core setters. The variable speed control permits change in conveyor speed necessary in operating the plant at half capacity over the noon periods.

A number of intangible savings are effected by this trolley conveyor. It is no longer necessary for core setters and helpers to reach around or through the core racks to obtain the cores they want. Nor must they keep in mind the possibility that the racks will be moved, nor need they watch for the lift truck which formerly was a source of considerable annoyance, not only to the core setters, but to all employees making use of the main aisles. Only one core setter must carry cores farther with the conveyor system, as installed, than with the system of lift trucks and racks. This individual sets only small cores so that he is neither slowed nor inconvenienced.

Coremakers place a completed core upon the conveyor, without turning around, as was necessary with the rack system, and it is never necessary to transport the heavy cores by hand.



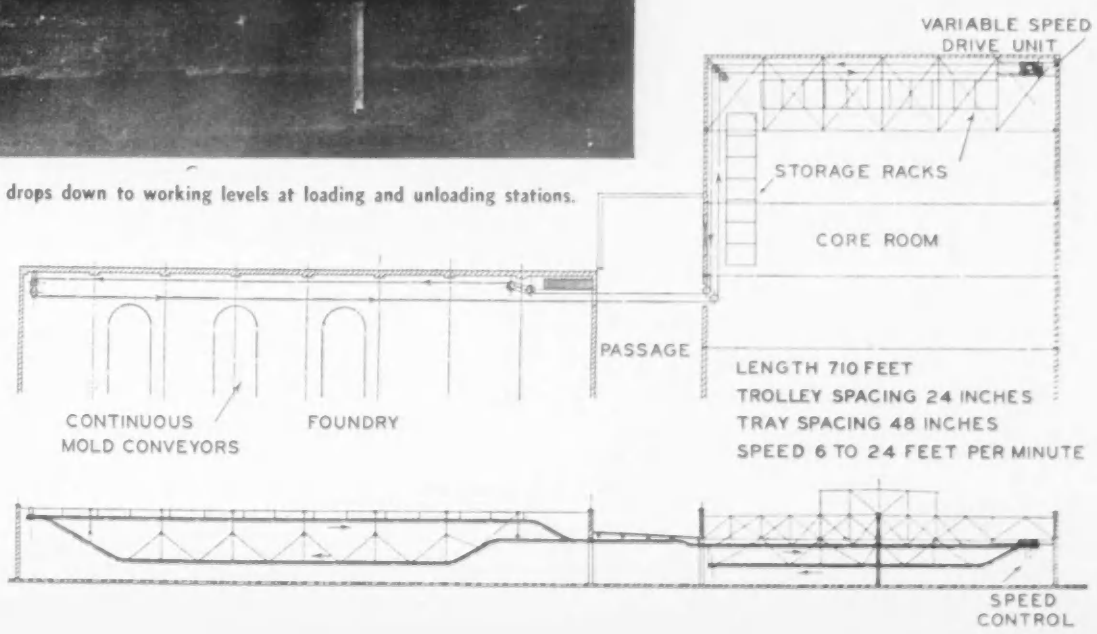
BETWEEN work stations the cores are conveyed overhead, resulting in conservation of floor space.



This conveyor drops down to working levels at loading and unloading stations.

which was frequently required in using the old method.

Every second tray on the conveyor is provided with a shelf which may be removed. At present the cylinder cores are loaded upon the tray without a shelf and the smaller parts upon the two shelves of the following tray. The very small cores and core setter supplies are handled in metal boxes. Empty boxes are returned to the storage racks on the conveyor. Should requirements demand the use of trays without the shelf or should they require all trays to be provided with shelves, the desired changes can be easily made.



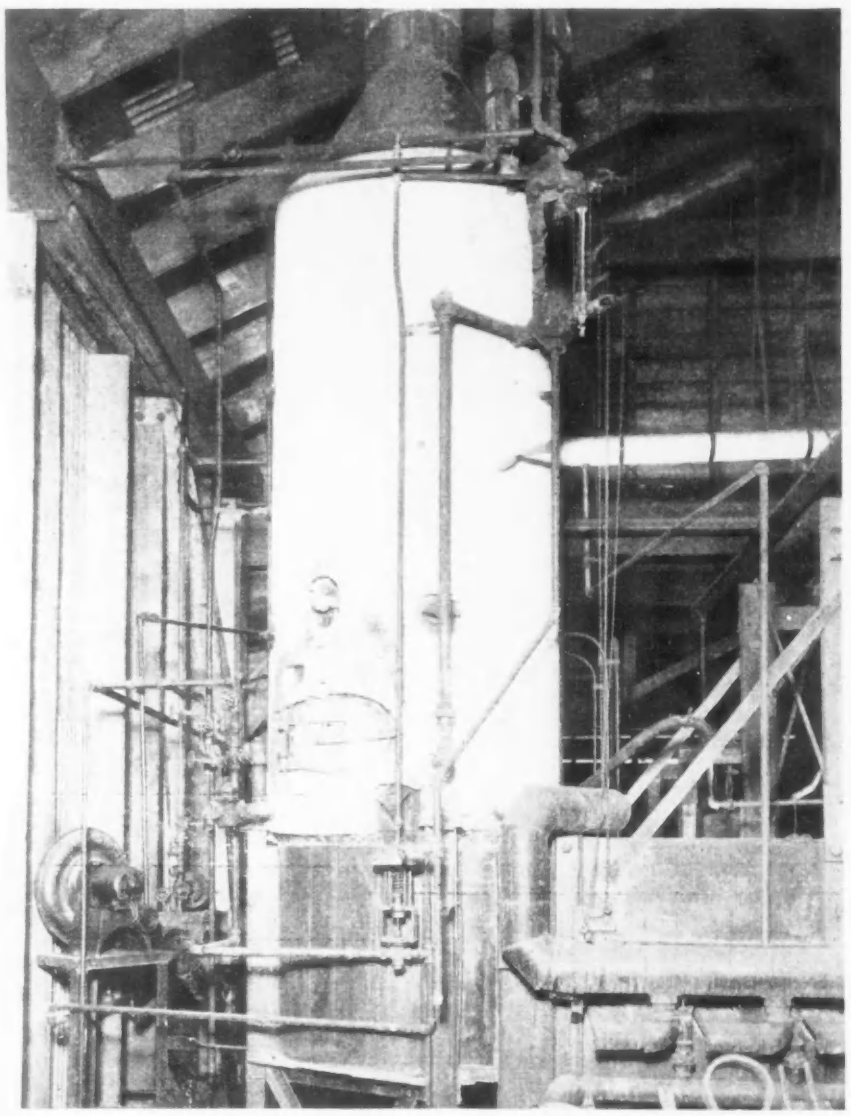
PLAN and elevation showing core conveyor location in the core room and in the foundry.

COMBINATION FORGE FURNACE

HOT forging has benefited from the development of forging furnaces that are more efficient as to both fuel economy and effectiveness in heating. Wider adoption of gas has helped to make this possible. A third development, from an entirely different angle, materially reduces costs of forge heating plus steam power.

Simple enough in design and realization, this consists in passing the waste heat from the forge furnace into the steam boiler which supplies power to the hammer. Thus two heating operations are accomplished with almost the same fuel consumption as one. This proposition was worked out at the plant of Skookum Co., Portland, Ore., with the aid of the engineering department of the Portland Gas & Coke Co.

Skookum Co. makes a complete line of small tools for the logging industry, logging blocks, and miscellaneous heavy equipment. It also conducts a large jobbing business in machining and forging. Included in the plant equipment are two steam hammers and a trip hammer which are served with two gas-fired forge furnaces. These furnaces are built in combination with tubular vertical steam boilers, both resting on a steel framework so designed that the firebox of the boiler nests into the upper backwall of the furnace. The waste heat flows through an opening in the back wall directly into the firebox. One of these boilers is 20 hp. and the other 30 hp.



Controls for operating combined forge furnace and steam boiler. Burners and manifold appear at lower right, water regulator near top of boiler and gas regulator in center foreground. At left is the fan to supply air for complete combustion, in the boiler, of the partly burned gases from the furnace.

Each furnace sets about 2 ft. above the floor and the boilers 3 ft.; they are nicely fitted, bolted and cemented together. The furnace is of brick construction (9 in. of firebrick), heavily insulated and has a 3 x 4-ft. hearth. It is heated with three gas burners on each side (six in all), firing tangentially against the arch and staggered so as not to fire into each other. The burners are of the nozzle mixing type, air being supplied by blower at 4-in. pressure, which is equal to the gas pressure at that point.

Each boiler has an auxiliary gas burner to which air is supplied from the same manifold. The gas-air mixture for the furnace burners is reducing, to minimize scaling. Hence, to complete combustion in the boiler firebox and not smother the boiler burner flame, an excess of air is provided through the auxiliary burner. The waste products of combustion finally leave through a stack in the top of the boiler.

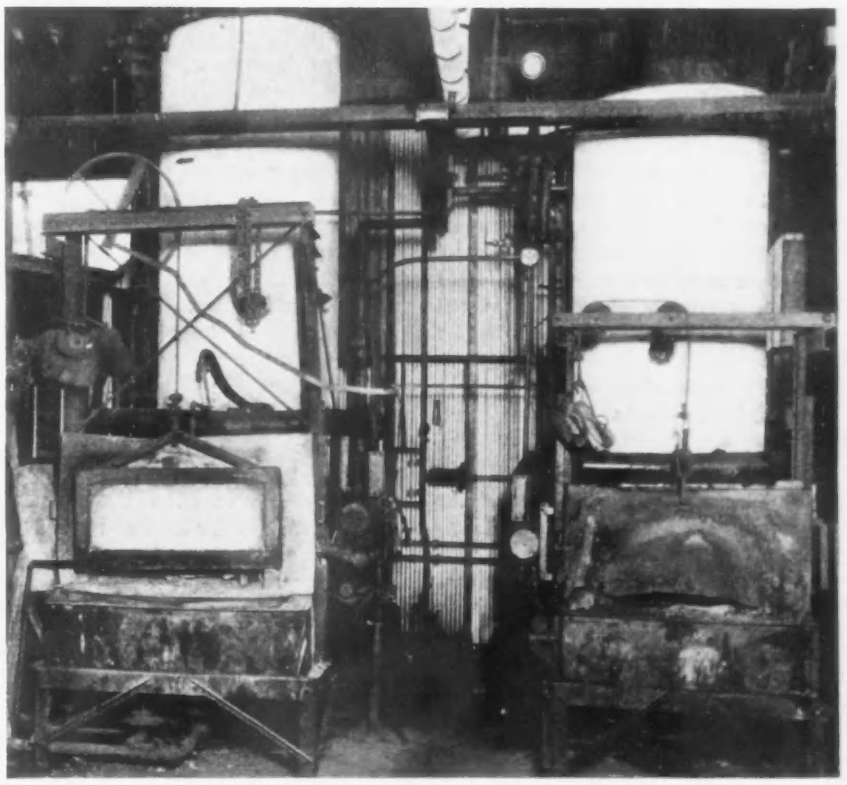
This combination forge furnace and steam boiler is equipped to operate automatically through a steam pressure control which, in turn, regulates the volume of fuel to the auxiliary burner and three of the furnace burners. This is a two-stage operation, the first stage consisting of a steam control valve in a by-pass air line, the valve being held open by a spring against the steam pressure. When the steam pressure rises above a point set on the control index, it forces the valve shut, thus cutting off the air supply.

The by-pass line runs between the main air supply line and diaphragm-operated valves in the air and gas lines to the burners. This constitutes the second stage, for the air pressure from the by-pass to one side of the diaphragms keeps the valves open and the burners firing. As soon

AND STEAM BOILER SAVES FUEL

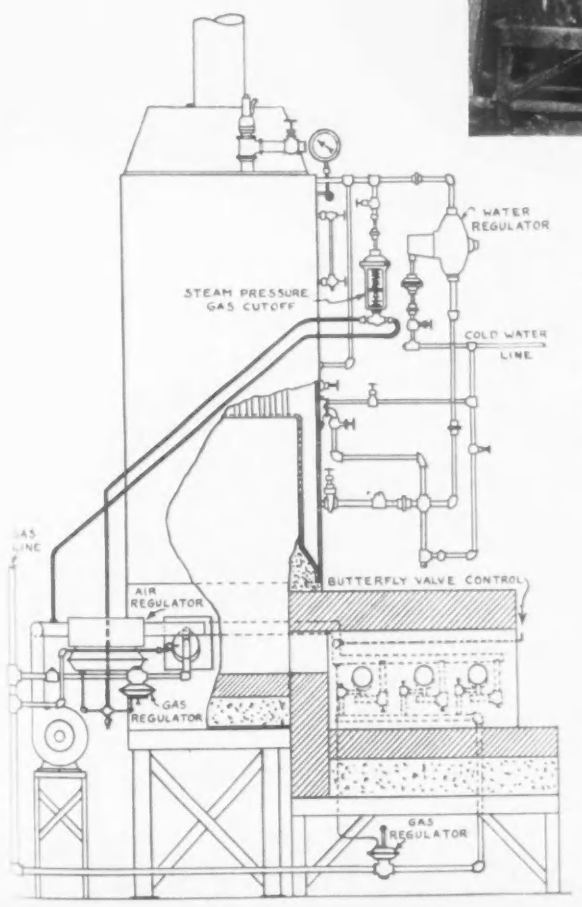
By J. B. NEALEY

MAKING the fuel do double work always reduces costs. By combining heating furnaces with waste-heat boilers, a forge shop has made a saving of 22 per cent in fuel consumption. Control between the two units is automatic, with the gas burners cutting in or out as needed. Use of a steam accumulator, to effect still further economies, is suggested. This would permit installation of fewer or smaller boilers, while still caring for peak loads.



TWO combination forge furnaces and steam boilers, fired with gas.

as the steam pressure rises too far, the steam valve closes and shuts off the air pressure, which in turn allows the diaphragms and their valves to sink and close off the flow of air and gas to the burners. Conversely, when the steam pressure drops, the steam valve opens and restores the air pressure, which in turn forces open the diaphragm valves.



ELEVATION and partial section, showing arrangement of the various controls.

Consequently, the auxiliary burner and three of the furnace burners are under automatic control, going on and off with the rise and fall of the steam pressure, which is a measure of the work being put through the hammers. During this time the other three burners in the furnace burn continuously, the air supply coming from a different blower. The auxiliary burner, only, requires a pilot light.

In this development the greatest problem was to obtain the closest heat balance possible between furnace and boiler, and at the same time utilize all of the waste heat from the furnace. When one of these units is started up in the morning, all seven of the burners are firing until the steam pressure in the boiler is up to

(*Concluded on page* 817)

BEARING METALS AS MADE AND U

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IN the study of bearing metals, the first significant fact to be observed is this: In not a single case has a pure homogeneous metal given satisfactory service. The same is equally true of all alloys in a state of solid solution. All bearing metals are alloys made up of two or more phases, that is, they consist of hard and relatively soft microscopic particles intimately mixed. It is not only necessary that a bearing alloy shall be composed of chemically dissimilar crystals, but it is all-important that these crystals shall have a marked degree of difference in their physical hardness and wearing qualities.

The function of the hard particles, or bearing crystals, is to support the load and resist the wear at such times when actual metallic contact exists between the bearing surfaces, either due to an excessive load or due to being at rest. The function of the softer particles, in a measure, is to allow the harder particles to adjust themselves to the surface requirements of the journal but their principal function is for them to wear down slightly below the harder particles, thereby forming slight depressions upon the apparently smooth wearing surface of the bearing.

"Run-In" Surfaces Studied

The author's first microscopical study on the behavior of bearing metals was made upon one of the early motor truck worm gears. This gear had given exceptionally satisfactory truck service for more than 70,000 miles. The "run-in" surface on one of the worm wheel teeth was very interesting. To the naked eye, it appeared to be a highly burnished surface, but under microscopical examination it clearly showed very distinct differences of level between the delta and the alpha crystals. The hard crystals stood in bold relief in amount from four to six microns above that of the softest.

In a series of subsequent studies on run-in surfaces of various alloys, on surfaces all of which had given long and satisfactory service, it was found in each case that the hard crystals stood in relief, and that the amount of this relief was dependent upon the bearing load. Other things being equal, the greater loads had produced the greater relief of the hard crystals.

It is this condition that properly characterizes a run-in surface. Consider these facts in the light of the more recent experiments conducted by Professor Hastings of Harvard University, namely, his high pressure tests, in which he has shown that with extreme pressure alone he was able completely to solidify fluid lubricating oil (while such pressure was maintained).

What Constitutes a Bearing Metal

Applying this fact to the minute quantities of oil held in these microscopic depressions on the bearing surfaces, it is evident that under such conditions the lubricant cannot be squeezed out, however severe the pressure may be. It is this almost infinitesimally small quantity of the lubricant distributed and confined upon the bearing surfaces that prevents scoring when the surfaces come in actual contact. Accordingly, the author's earlier definition of a bearing metal still holds, namely: A bearing metal is an alloy that is capable of retaining a lubricant upon a bearing surface.

One of the most striking illustrations as to what constitutes a bearing metal and what does not is shown very forcibly by the tin and zinc copper alloys. An alloy containing sufficient tin to produce the hard delta crystal is a bearing metal, whereas copper containing the same percentage of zinc is not. In the bronzes or copper-tin alloys, we have a wide range of hardness between the hardest and softest crystal. These crystals are likewise made up of different chemical proportions, owing to the tendency of the tin to separate from the copper during the cooling and solidifying process. On the other hand, in the brass, the copper-zinc alloy, we have one crystal only. The entire mass, microscopically considered, is made up of the same chemical composition and has, except for slight anistropical effects, the same degree of hardness throughout, and for that reason brass is not a bearing metal.

The different compositions of so-called manganese bronze, more properly manganese brass, for the reason that they so nearly represent the microstructure of common brass, are not bearing alloys. The same, in a less degree, is true of aluminum bronze of such compositions where distinctly different crystals exist, both the alpha and beta. The difference in hardness between these two crystals is so slight that, in general, aluminum bronze cannot be considered as a

Fig. 1.—Photomicrograph (500 diameters) showing the epsilon tin-copper crystal with the inner darker formation of $SnCu_3$, the hardest tin-copper formation.

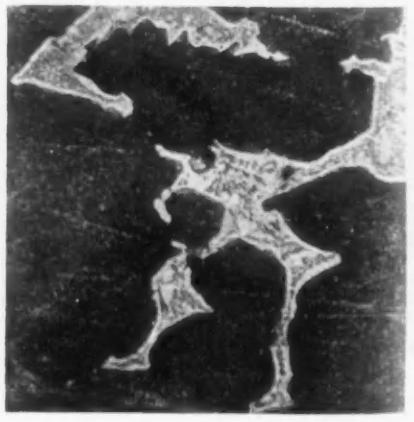


Fig. 2.—Photomicrograph (500 diameters) showing the normal eutectoid form of the delta crystal in a bronze not containing nickel.

ND USED TODAY

By C. H. BIERBAUM
Vice-president
Lumen Bearing Co., Buffalo, N. Y.

IN this comprehensive review of essential facts regarding present-day bearing metals, presented at a conference on metals and alloys in Cleveland, emphasis is placed on the fact that hard and soft microscopic particles, intimately mixed, are necessary to insure a satisfactory product. Chemical composition, the author states, is not a final criterion of bearing value. The metal must have the proper microstructure, and this may be seriously disturbed by heat treatment.

Short-time laboratory tests of bearing metal are condemned as being without value.

Among improvements in bearing metals, nickel phosphor bronze is particularly commended. Late developments likely to have far-reaching effects on this industry include nitriding and chromium plating.

The author concludes with a protest against improper tooling.

bearing metal when compared with a proper copper-tin alloy.

Bad Effect of Heat Treatment

Quite recently a superintendent of motive power demonstrated, even to his own satisfaction, this fact—that brass is not a bearing metal. Having equipped a locomotive with rolled brass on the cross-head guides, to his surprise he found that he was not able to run this locomotive far beyond the yard limits. On the other hand, it is not alone necessary to have an alloy of the proper proportions of copper and tin in order to have a bearing metal. This is shown by an equally striking illustration. Some time ago an English railroad system found considerable annoyance with the breaking of locomotive bronze castings. At about the same time it was discovered that this breakage could be completely overcome by subjecting these bearings to a heat treatment, with the result that, after applying this remedy, the entire railroad system came near being laid up, due to poor bearing material[1].

The effects were as follows: Heating the bearings to a high temperature caused a reabsorption of the delta crystal. This improved the physical properties of the bronze very materially, all breakage being overcome, but its bearing value at the same time was destroyed for want of a hard and soft crystal structure. This demonstration proved, on a large scale, that even the chemical composition of a bronze is not a final criterion as to its bearing value. The bronze must possess the chemical composition, also the proper microstructure. The production of the latter is largely dependent upon foundry practice, its pouring temperature and rate of cooling.

[1] *Journal Institute of Metals*, 1913, Vol. 9, page 176.

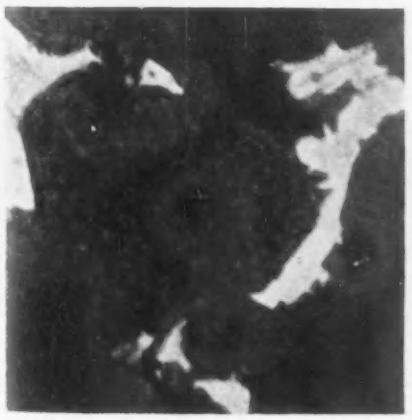


Fig. 3.—Photomicrograph (500 diameters) showing the non-eutectoid hard crystal in bronze containing an excess of one per cent of nickel.

Journal and Bearing Should Polish Each Other

In studying bearing metals in relation to their application, it is necessary that the journal or mating member likewise be given full consideration. It is desirable to have their relation such that the bearing and the journal shall mutually polish each other. The hardest crystals in the bearing metal should not be hard enough to prove distinctively abrasive to the journal and the softest crystals in the bearing metal should not be soft enough to flow or distort under maximum service requirements and temperature. For the best service conditions, therefore, it is essential that the journal should have a high degree of homogeneity and, on the contrary, the bearing metal a high degree of heterogeneity.

In cases where both the bearing metal and the journal have a distinctively heterogeneous structure, very erratic and unsatisfactory results may be expected. A very interesting case of this kind is on record, in which aluminum bronze bearings were tried out in a rolling mill. The roll neck was chill cast iron and the bearing was a special aluminum bronze. This bearing had been heat treated with great care so as to convert all of the beta crystal into the gamma state. The bearing was placed in service and in less than an hour it had heated to a red heat and before the mill could be stopped it was approaching its melting point, a very unusual and unexpected occurrence.

A microscopical study of these two elements proved to be very interest-

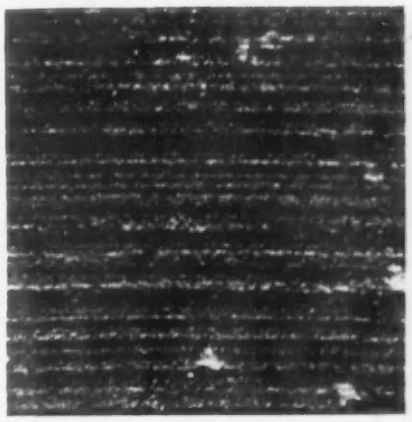


Fig. 4.—This photomicrograph at 100 diameters reveals a tooled surface of soft babbitt with a steel tool carefully lapped with depth and feed of cut 0.002 in.

ing. An accurate estimate was made of the aggregate area of gamma crystal in the bronze, and a likewise accurate determination of the aggregate area of the ferrite crystal was made upon the material in the chilled neck. Now, if we assume that only the hard crystals of one member were bearing upon the hard crystals of the other members and computing from their percentage composition the aggregate area of hard crystal bearing upon hard crystal, we find this to be 1.8 per cent of the total bearing surface. Of course, the softer crystals supported their share of the load. This, however, did not prove to be sufficient to prevent the harder crystals from interlocking and causing this very disastrous result.

Case of the Tin-Base Babbitts

The desirability of having the proper crystalline structure, in addition to the chemical composition, does not apply to bronzes only, but it also applies to the tin-base babbitts. This is shown very strikingly and conclusively in the remarkable series of babbitt tests made by Holm Graefe, of the Siemens-Schuckert Werke A.G.[2] A number of tests were made on the same babbitt, the only variable being the temperature of pouring of the babbitt and the temperature of the backing against which the babbitt was poured; that is, the only variable consisted in the rate at which the babbitt cooled.

It has been very generally held that babbitt cannot be chilled too severely; for a high tin and relatively high copper babbitt, this conception is quite erroneous. In the pure tin base babbitt, with a high percentage of copper, the copper appears in the epsilon crystal. If, however, this crystal is given sufficient time to form slowly, a much harder formation than the epsilon crystal appears, namely: the $SnCu_3$ composition forms inside this crystal. (Fig. 1.) This latter composition is the hardest of all tin-copper constituents. If, however, the babbitt is cooled very quickly, the inner crystal has not the time necessary to form, with the distinct result that a softer babbitt is produced by intense chilling. In the tests referred to, it was found that this babbitt, when slowly cooled, produced far superior results, in that it was able to support heavier loads at lower temperature. The fact that a harder formation was produced and that the favorable result could be attributed to this fact did not seem apparent to the investigators.

All of the favorable results of slowly cooling this babbitt are, of course, predicated upon having a journal of sufficient hardness, which was the case in the above tests. An ordinary, soft, low-carbon steel mated with a babbitt in this condition would

Fig. 5.—Structure of the same piece of metal as in Fig. 4, but tooled with a sharp diamond (100 diameters).

not produce the desired effect, owing to the fact that this crystal would be distinctly abrasive to such a journal. The foregoing facts clearly account for some of the early troubles which the Government found in airplane service, where an alloy known as Fahrig metal, 90 per cent tin, 10 per cent copper, was tried out on relatively soft steel journals.

Destructive Testing of Little Avail

During the last 40 years an enormous amount of study and bearing testing has been done by individuals, private corporations and research institutions. If, on the one hand, all the facts could be assembled, the aggregate amount of work done would be simply enormous; on the other hand, the small amount of positive information obtained would be far more astounding.

The answer to all this is self-evident. Investigators hoped to obtain, by means of tests of a few hours' duration, actual bearing value. This necessitated making distinctive tests. The entire history shows that destructive bearing testing, of necessity, must be a complete failure. With all of this destructive laboratory testing, so far "no one has gotten anywhere and all have gotten nowhere."

This subject of bearing testing can very properly be concluded with a quotation from an old report of the subcommittee on bearing metals of the American Society of Mechanical Engineers[3]—"It seems exceedingly improbable that laboratory accelerated service tests can ever give general satisfaction, owing to the difficulty of reproducing, in a few hours' time, the equivalent of many years of service conditions. It is our conviction that much more can be learned from the study of failures and also in studying old bearings, together with their journals. which have given eminently satisfactory service for an exceptionally long period."

Beneficial Effect of Nickel

One improvement in bearing metals that has been made in recent years is the nickel phosphor bronze.[4] It has been found that, with the introduction of nickel into a copper-tin alloy, the physical properties of the resulting alloy are materially improved and at the same time its bearing value is likewise improved, for the simple reason that the introduction of a small percentage of nickel will not harden but rather soften the alpha crystal.

In addition to that, the presence of nickel causes the hard or delta crystal to form in a solid mass formation (Figs. 2 and 3). One per cent of nickel present will cause the delta formation to lose its eutectoid structure and form as a solid hard mass. Although a microhardness of this hard crystal is not appreciably higher than a solid spot on the eutectoid crystal, this resultant solid mass formation has a greater abrasion resistance and consequently is an improved bearing metal.[5]

Two New Developments—Nitriding and Chrome Plating

There are two new metallurgical developments that may have a very far reaching effect upon both bearing design and performance. They are nitrided nitralloy and chrome plate. An interesting feature, in addition to the hardness of the nitrided nitralloy surface, is its extreme degree of homogeneity, an argument distinctly in favor of this material over that of pack or case-hardened surfaces.[6]

In the same manner, a chrome plate surface for one member of a bearing is very promising. This will be especially so when chrome plating shall have been developed to a point where uniformly satisfactory surfaces can be produced, that is, surfaces that are hard and free from extreme cracking. Very satisfactory surfaces have been produced, both as regards hardness and homogeneity. At the present time, however, there are still found erratic results, some of which in some cases may not prove satisfactory.

(*Concluded on page* 817)

[2] *Maschinenbau*, Oct. 20, 1927, pages 1001-1005.

[3] *Trans.* A.S.M.E., 1921, page 1273.

[4] U. S. Pat. No. 1,687,924, Oct. 16, 1928.

[5] Lumen Bearing Co.'s Engineers' Hand Book, second edition, 1930.

[6] *Transactions*, American Society for Steel Treating, Vol. 18, January, 1931.

MANUFACTURING COLD ROLLED STAINLESS STRIP STEEL

By F. L. PRENTISS
Cleveland Editor, The Iron Age

FOR the manufacture of cold rolled stainless strip steel a cold rolling plant recently was erected by the Republic Steel Corpn. at its Central Alloy Works in Massillon, Ohio, and was placed in operation early in January. The plant equipment consists of a 20-in. cold strip mill in three stands arranged in tandem, a small single stand for light reductions, three normalizing and annealing furnaces, pickling and various other equipment, providing a complete unit for the manufacture of cold rolled chrome nickel steel. The plant has a capacity for making strip in widths of ½ to 14 in. and in thickness from 0.010 to ¼ in.

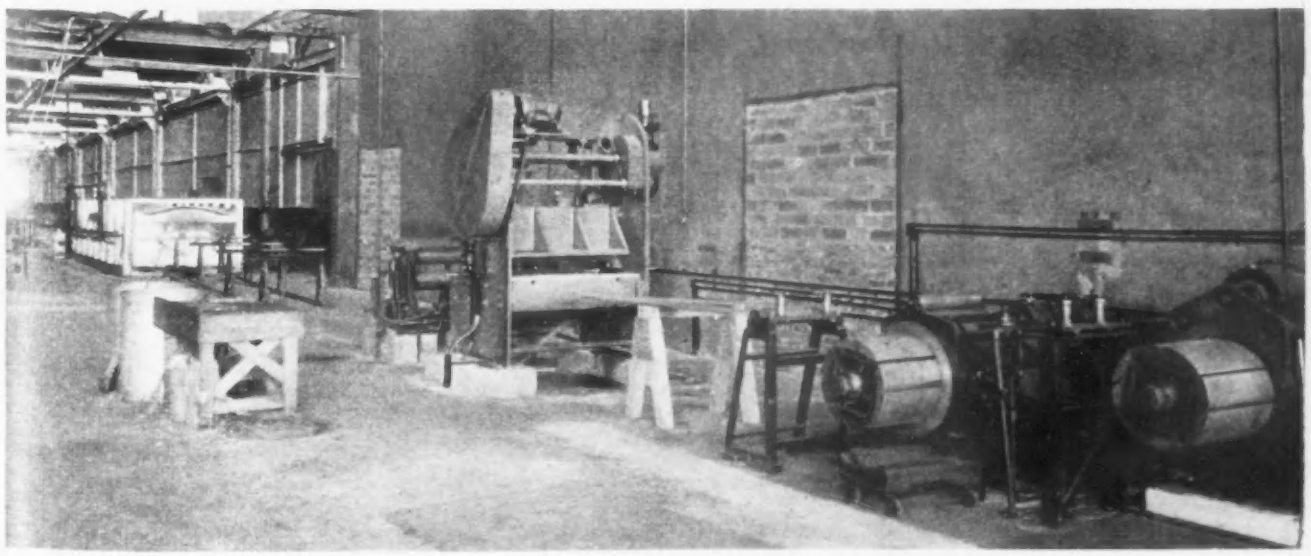
Research pointing toward the production of cold rolled stainless strip by Republic began nearly two years ago. Experience in the problems encountered in making hot strip of plain carbon steel was of particular value in this direction. Earlier investigation at the Elyria plant of Steel & Tubes, Inc., Republic subsidiary, where cold rolled strip had been produced in large tonnage for several years, had already indicated the necessity of special hot rolling and specially designed equipment for cold rolling, because of the peculiar nature of requirements for such production.

THE successful cold rolling of stainless strip steel presented problems not encountered in the cold rolling of plain carbon steel. How these problems were solved by the Republic Steel Corpn. is related in this article, which describes the equipment and operation of the stainless strip cold rolling plant of this company, which was put into operation early this year in Massillon, Ohio.

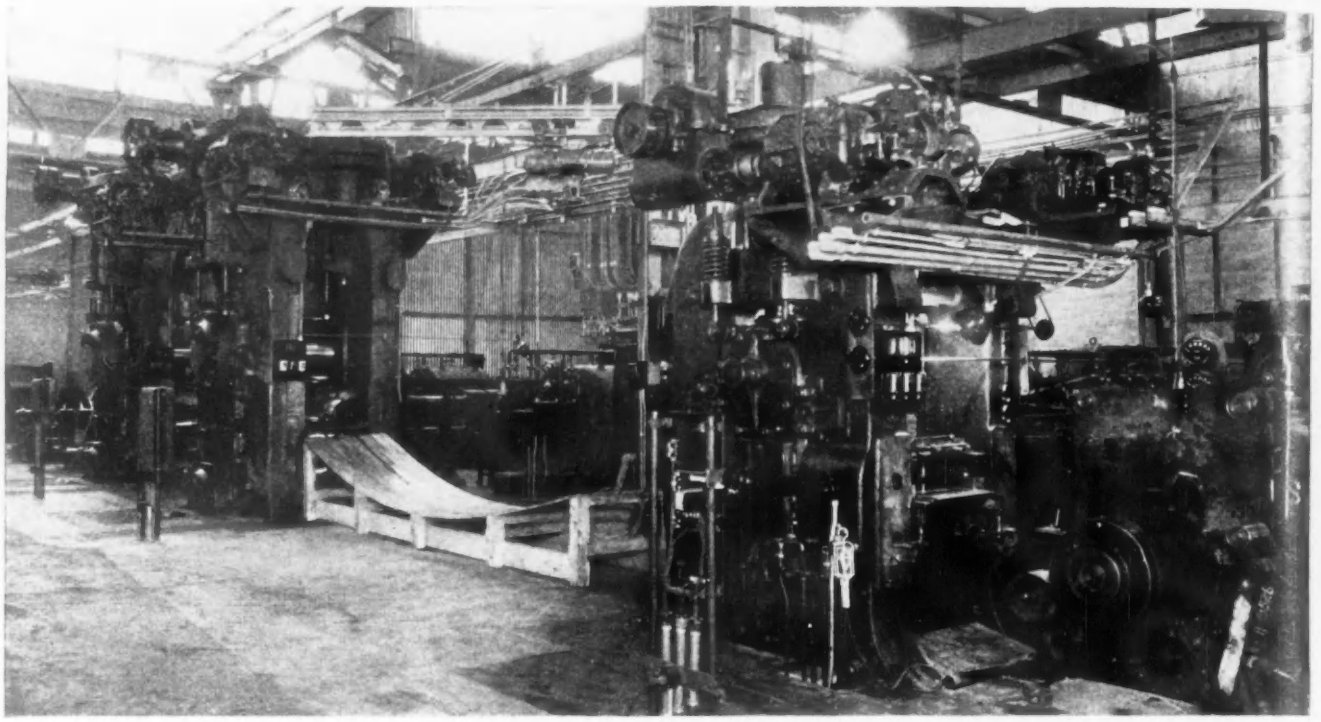
A specially designed cold rolled strip mill for stainless production was installed, in order to determine definitely the limitations of production. Following a year's successful operation, the mill was transferred to another plant and the installation of the new 20-in. mill started.

One of the chief difficulties to overcome was that provided by the stiffness of hot rolled strip. Equipment of special and intricate design was developed to meet this situation. Another difficulty had to do with the design of special levelers for the strip prior to its first annealing. That the installation of the new plant was begun and completed during a year of depression when many mills were closed down for lack of orders offers an interesting picture of the confidence possessed by the Republic officials in the market possibilities for cold rolled stainless strip.

Practices in cold rolling stainless steel do not differ in a general way from those followed in making cold rolled strip of plain carbon steel. The former is harder than the latter, and is harder on the mill than the plain steel. The passes given the stainless material are about the same as in the reduction of plain carbon steel. How-



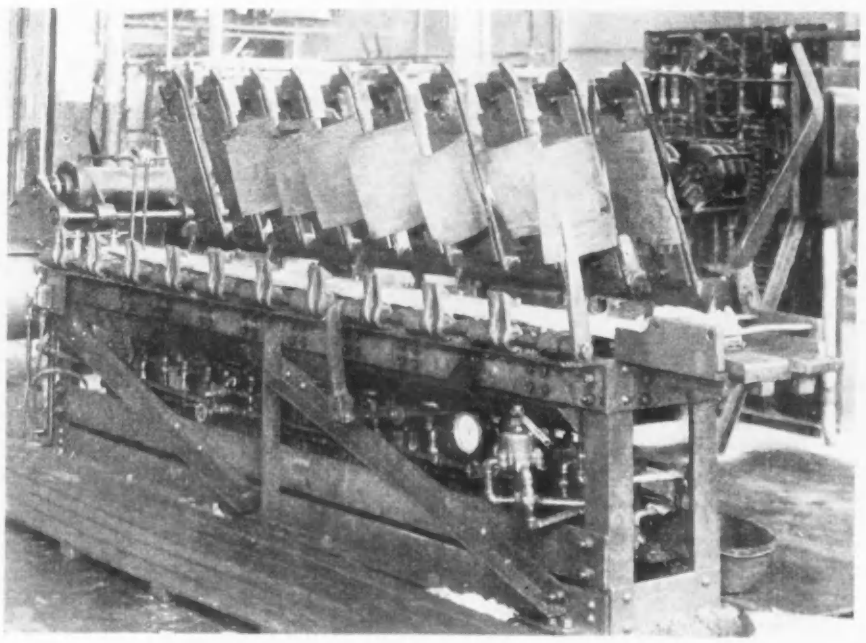
Furnace in which stainless steel strip is normalized before being cold rolled. The strip is drawn through the furnace by the reels shown at the right. Pieces are held together with a rivet and the ends are cut off by the shear that is shown. From here the coils go to a pickling room.



View of the three 20-in. cold rolling mill stands. A movable recoiler handled by a jib crane is provided. This is set back of the second or third stand. The use of the recoiler increases the flexibility of the mill.

ever, there are two important differences in the practices. While plain carbon steel requires no heat treatment between hot rolling and the first cold rolling operation the stainless steel is too hard to be cold rolled without first normalizing. Hence normalizing is the first operation in the cold rolling department. The steel has a hardness of 108 Rockwell B after hot rolling and this is reduced by the preliminary normalizing to 85 Rockwell B. The second important difference in practices is that stainless steel is annealed in continuous furnaces between reductions, this taking the place of annealing in a closed pot furnace that is necessary between reductions in making plain carbon cold rolled steel.

Economies in production are effected by having the plant well arranged for routing the work from operation to operation. The strip from the time it reaches the department from the hot mill until it is in its finished form ready for shipment moves over a route that may be described as being generally circuitous. A feature of the layout is the provision of an extensive overhead conveyor system consisting of monorail tracks and cranes equipped with 1000-lb. electric hoists. These are hand pushed on their tracks.



Specially designed polishing machine for cleaning scale from strip after coil pickling and before rolling.

The first two 20-in. mills are 4-high mills with 20-in. face by 15-in. diameter rolls. The back-up rolls are 30 in. in diameter. Rolls of the third mill or finishing stand are 9¾ in. in diameter and have 25 in. diameter back-up rolls. These mills have motor driven screw-downs.

Strip 0.125 in. in thickness is reduced in these mills to 0.050 in. or to 0.060 in. thickness in one pass through the three mill stands and then it is annealed before further reduction. In reducing the strip to 0.025 in. thickness the practice is to reduce it from 0.125 to 0.050 in. by one pass through the three stands, then anneal it, after which it is further reduced to the required thickness. The speed of the mill ranges from 85 to 125 ft. per min.

For the first passes the coil is fed through the mill from a coil box. For succeeding passes it is placed on a pay-off reel. This reel, which was designed by the company, is equipped with a lever for holding the strip taut, but no great tension is applied during rolling.

The first two mill stands are on 14-ft. centers and the distance between the second and third stands is 25 ft., providing room for a movable recoiler, which is set back of either the

econd or third stand. A jib crane on which is mounted a tramrail carrier and electric hoist is located at the side of the second and third stands on the delivery side for moving the recoiler from one position to the other and for handling coils to floor trucks that carry them to the annealing furnaces. The use of the recoiler increases the flexibility of the mill, for the first two stands may be used for reducing one lot of steel while other material of perhaps a different width may be going through the third stand at the same time. If the steel is being passed through all three stands, heavier material usually is wound on a spool on the recoiler and the lighter material is coiled on a reel.

A layer of paper is rolled between the steel as it is rolled on the reels or recoiler to prevent the steel from getting scratched by surface contact. The paper is fed between the steel from rolls located on a swinging arm at the side of the coiling equipment. The mill room is served by a 13-ton Cleveland electric traveling crane.

The first two mill stands were built by the United Engineering & Foundry Co. and the third by the E. W. Bliss Co. The former company also supplied a small mill for light reductions, which is located in another room. This is a 2-high mill with 18-in. face and 16-in. wide rolls. Strip as thin as 0.006 in. has been rolled on this mill since it started.

The hot rolled strip comes from the hot mill in 100 ft. coils 6 in. to 16 in. wide and in thickness from 0.095 in. to 0.175 in. The average weight of a coil is 400 lb. The coils are unloaded from gondola cars to storage with a monorail crane and 1-ton electric hoist. Normalizing before cold rolling is done in a natural gas fired con-

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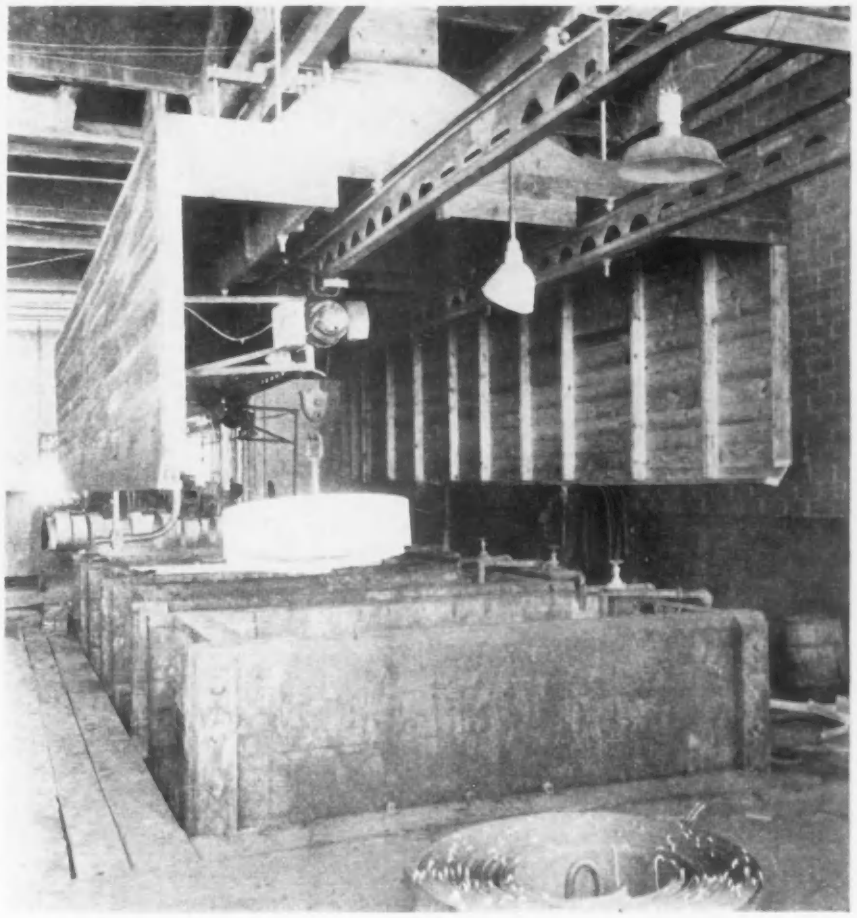
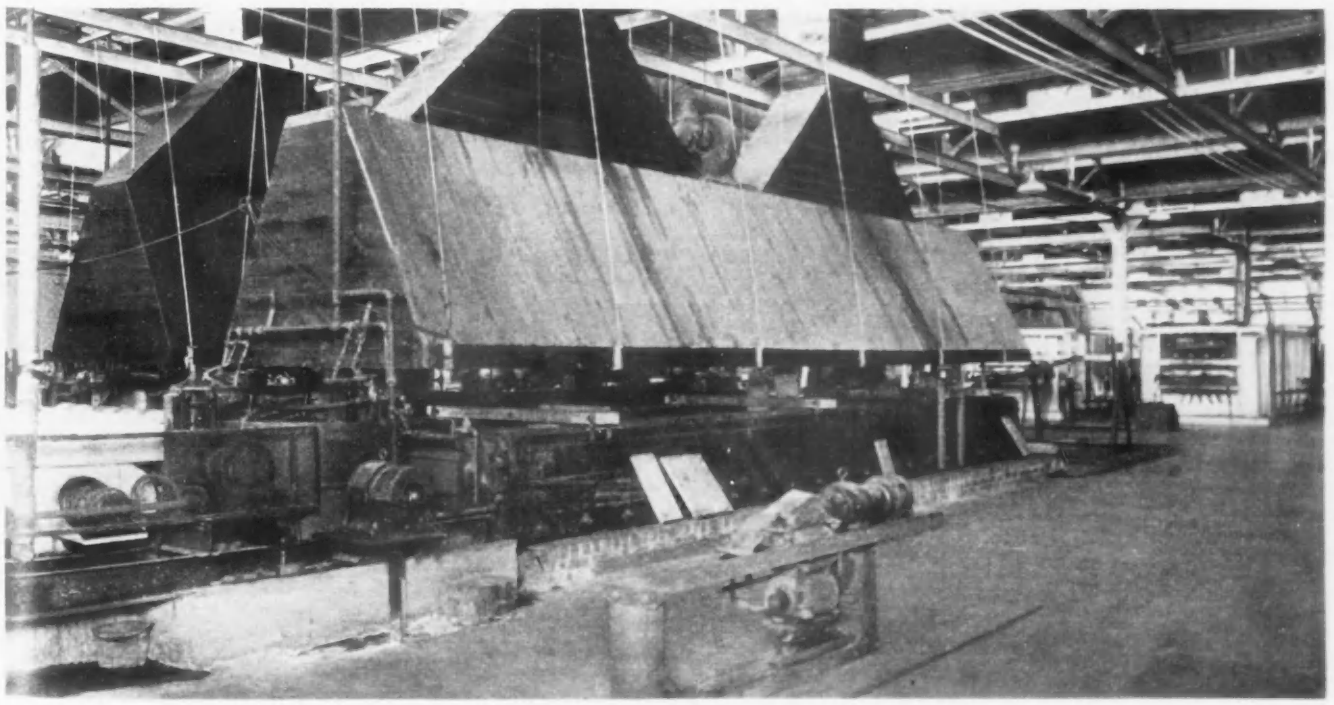
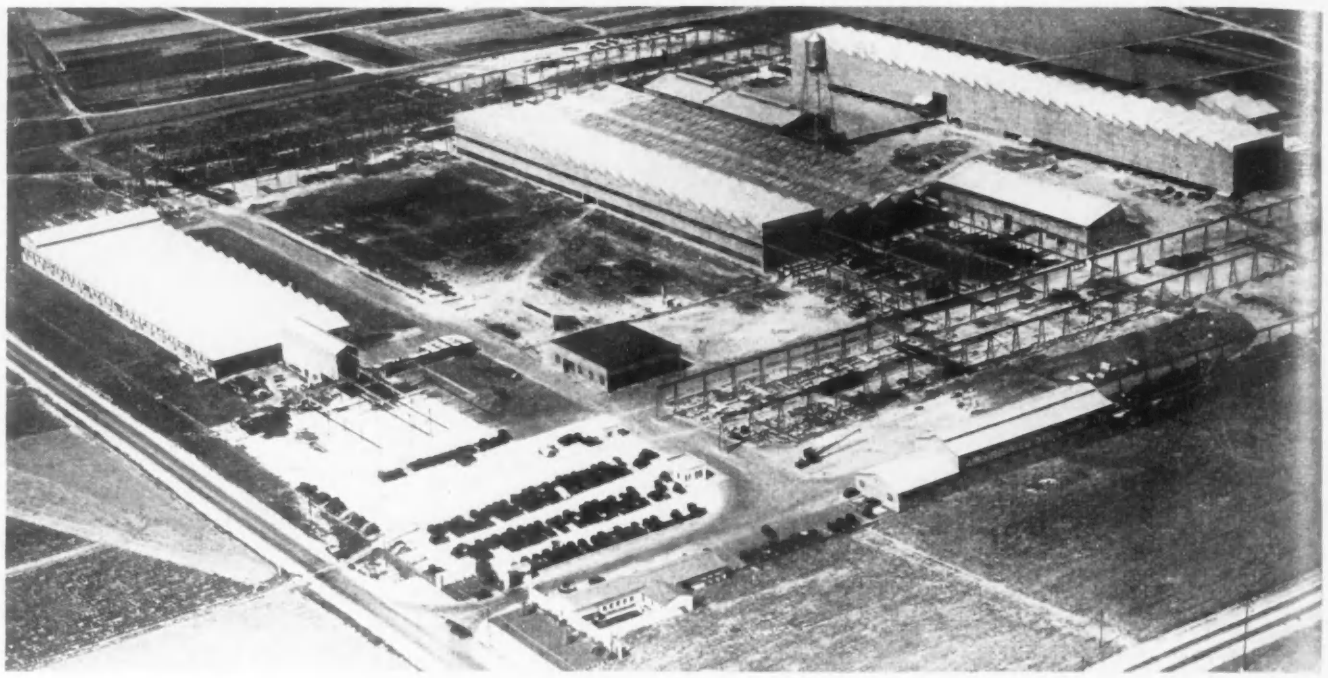


View in the coil pickling room showing the conveying equipment. Coils are handled with electric hoists and there are two tramrail tracks over the pickling tank so that two coils may be pickled at a time.



The continuous pickling machines which operate in connection with the continuous annealing. Strip leaving the discharge end of the annealing furnaces at the right passes through the tanks of the continuous picklers after which it is scrubbed and dried.



West Coast Fabricators Complete New Plant

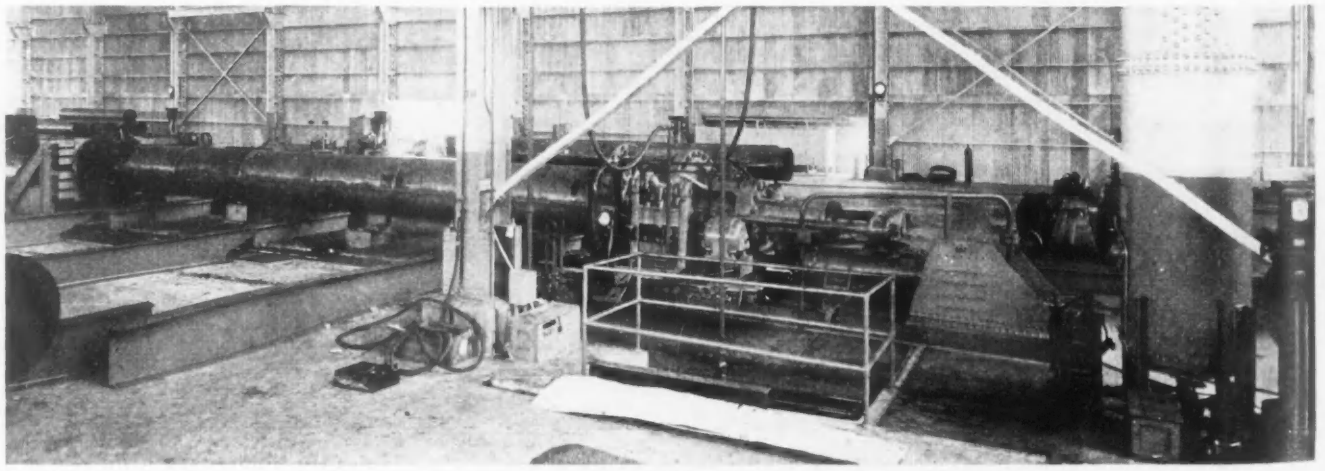
COMPLETION of 11 new factory buildings by the Consolidated Steel Corporation, Ltd., marks the end of that organization's recent development program which was celebrated recently with a removal of all operations to its 50 acre steel fabricating plant in the industrial district of Los Angeles.

The new establishment represents the entire replacement of two older steel plants—those of the Union Iron Works and the Baker Iron Works—together with the partial replacement of the Llewellyn Iron Works. To this group has been added a new specialized welding unit and a separate plant operated by the Gallagher Company for the manufacture of floating pontoon roofs used on oil storage tanks.

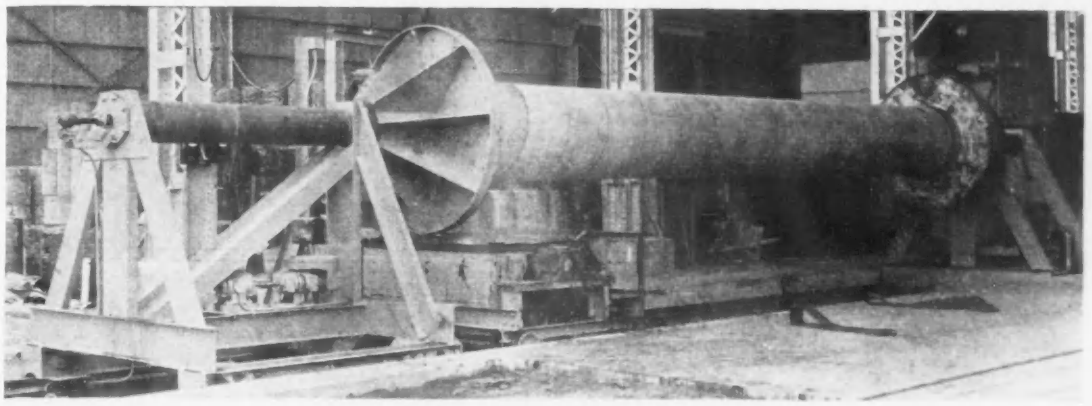
The new structures include a welding shop, structural shop, pontoon shop, machine shop, erection equipment warehouse, and a main warehouse. Thirty cranes, some with runways 1200 feet long, a span of 90 feet, and a capacity of 25 tons, aid in moving materials and finished pieces.

With a capacity of a mile of large electrically welded steel pipe per day, the welding shop is perhaps the most interesting feature of this new plant, largely because it is reported to be the most modern unit in this type of steel fabrication. It is 750 x 120 ft. and is equipped to produce pipe with a diameter of 22 in. and larger, as well as tanks and other tubular equipment.

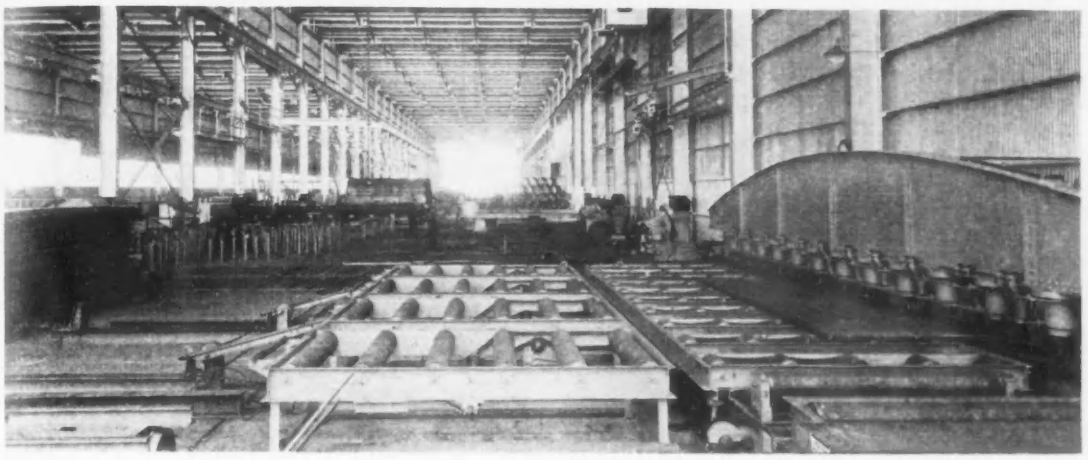
A pre-heating unit and vertical dipping kettle are important features, giving this plant a unique position in the southern California steel industry. The pipe is heated to 400 or



Testing the completed pipe lengths by hydraulic pressure.



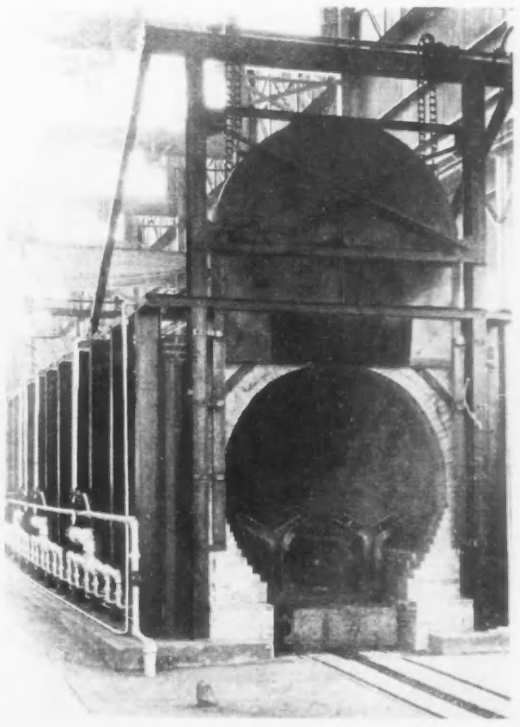
THE pipe welding shop has a capacity of a mile of large diameter, electrically welded steel pipe per day.



INTERIOR of one of the main fabricating bays showing plate planer at right and bending rolls in background.

500 deg. F. in the horizontal furnace equipped with natural gas burners before being dipped in the kettle which is sunk into the ground for 50 feet.

The structural steel shop is 600 feet long and 225 feet wide with ample provision made for expansion in the future. It is equipped with machinery for the fabrication of all types of shapes, including small as well as heavy pieces. As in the entire plant, this department has many automatic and special handling devices to facilitate the fabricating operations.



FURNACE for preheating large diameter welded pipe which is to be dipped.

A 30 in. diameter pipe being removed from the underground kettle, which is 50 ft. deep. Dipped lengths drying at right.

MONEY SAVING IDEAS F

— 53 —

Cuts Assembling Costs

A MANUFACTURER of gasoline engines has introduced pneumatic tools for turning up bolts in the assembly room and has thereby appreciably increased the production of this department. Lock washers are used and the nuts are turned against these with small portable tools. Similar opportunities to reduce assembly costs exist in many plants.

— 54 —

Uses Group Payment Plan

A LARGE manufacturer of universal joints has adopted a group contract plan for paying its employees. Each unit of production is operated by an independent group which maintains its own foreman and inspectors. Each group picks its leader, establishes its time-keeping system, pays its own inspectors and receives its collective pay as a fixed allowance per piece produced.

— 55 —

Eliminates Set-Up Time

MOST small milling machines may be equipped with a revolving table at small cost. This permits the setting up of the work on one side of the table while a cutting operation is in progress on the other side. Such a device often entirely eliminates the time required for the setting up because the operator uses what would be idle time otherwise.

— 56 —

Normalizing Before Heat Treatment

A JOBBING forge shop has corrected warping of complicated pieces under heat treatment by normalizing to remove strains before tempering. The forgings are in the heavy class and the steel used is an alloy containing 0.32 carbon, .050 manganese and about 1.50 chromium. The normalizing temperature of 1700 deg. Fahr., is held for eight hours and the pieces are then allowed to cool in still air to 600 deg. Fahr., when they are returned to the furnace for the regular tempering sequence.

— 57 —

Double Conveyors Speed Production

A WRENCH manufacturer has greatly increased his production by providing each operator in the grinding department with two roller conveyors, one on each side. The parts to be ground arrive in tote boxes in one conveyor and the finished parts depart by gravity in other tote boxes on the opposite conveyor.

— 58 —

Brackets Prevent Cracks

THE use of brackets to avoid cracks at the junction between light and heavy sections of alloy castings has proved an economy in the case of a foundry specializing in chrome and nickel alloys. The brackets are removed with an electric torch at a total expense equal to about half the former loss due to cracks.

— 59 —

Makes Bolts to Keep Busy

A LOCOMOTIVE repair shop instead of laying off men, decided to manufacture its own tie bolts, and the plan has worked so well that it is extending the business to supply an outside demand. Many shops other than railroad might find this a good plan.

— 60 —

Foundry Uses Roller Conveyors

A ROLLER conveyor system has been installed with success in a large jobbing foundry. The conveyors are standardized and made up in sections so that they may be switched from one location to another to take care of changing conditions in the shop. The rollers are maintained at about 12 in. above the floor level. Molds, castings and scrap are handled throughout the plant by these conveyors.

— 61 —

Adds Chromium for Machinability

A MANUFACTURER experimenting to determine the machinability of high chrome iron alloys has found a marked variation in the properties of different alloys corresponding to a relatively slight variation in the chromium content. In one case he found that an 18 per cent chromium alloy casting was unmachinable unless double annealed. However, by merely increasing the amount of chromium to 24 per cent, he obtained a readily machinable alloy. Certain physical properties unessential for his use were altered by the added chromium.

FOR WORKS MANAGERS

— 62 —

Cracks in Die Castings

THE manager of a die casting plant gives 15 reasons for cracking: 1, metal temperature not correct; 2, die temperature not correct; 3, inside diameter and outside diameter of insert not concentric; 4, die not lined properly; 5, machine not lined properly; 6, wear in dowel pins permitting upper half of die to drop slightly when being opened; 7, hole in insert fitting too snugly on core so that when core is withdrawn strain is put on casting; 8, hole in insert too large, allowing metal to flow between insert and core; 9, outside diameter of insert fitting too snugly in sleeve core, causing strain when core is withdrawn; 10, outside diameter of insert too small, permitting metal to flow between insert and sleeve; 11, bent core pin in insert; 12, casting remaining in die too long before ejecting; 13, under-cut in die caused through closing die on chips or flashes from previous shots; 14, wear in ejector guides, causing casting to be ejected unevenly, and, 15, upset end of cores.

— 63 —

Salt Layer Betters Grain Structure

WHEN using a salt bath for annealing one manager of a heat treating department is careful to have the salt compound melt at a temperature but slightly below the operating temperature. When this is the case the salt freezes about the cold work as it is immersed and the frozen layer then melts off as the metal comes up to the desired temperature. In this way the frozen salt layer acts as a cushion against the sudden high temperature with resultant improvement in grain structure.

— 64 —

Develops Weldless Turnbuckles

A FORGE shop has developed a method of making long weldless turnbuckles. A bar of the desired length is formed to the approximate shape of the buckle under a steam hammer and then by using a short set of dies and turning the bar from end to end both ends are accurately shaped, leaving the central portion unfinished. A second set of straight dies moved back and forth along this central portion completes the turnbuckle. The trick in developing this method has been in designing the straight dies so as to avoid forming ridges where the straight portion joins the formed ends.

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Color Indicates Axe Temper

AT a small but successful axe manufacturing plant, the manager himself is an expert hardener and temperer and is thus able to step in at a moment's notice in case the regular operator is absent. The axes are placed in an oil-fired furnace so that part only is heated to high temperature. A portion extending from the bit edge inward is raised to a cherry red heat and is then quenched in brine and afterward ground. If the temperature has been right, the grinding will reveal a blue streak at the base of the bit. Axes with this blue streak are placed in a second or draw furnace and left there until the blue streak gradually rises and spreads to cover the entire bit. After this they are quenched a second time in water at room temperature. The manager says he is careful to allow for dark or cloudy weather when judging the cherry red temperature.

— 66 —

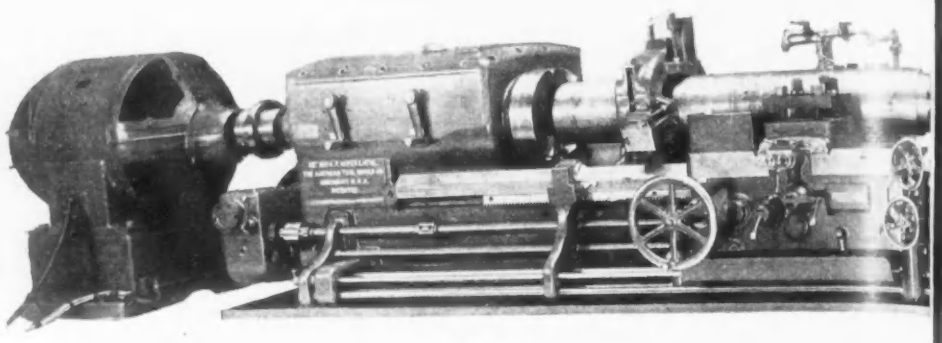
Gold Plating Not Expensive

CONTRARY to a rather general opinion the gold plating of small metal parts is not expensive. With sufficiently high production to warrant the installation of suitable equipment the average run of small brass parts may be gold plated for three cents a surface foot. One razor manufacturer has a plating machine with a capacity for 10,000 blades per hour and with but two men needed for controlling its operation. This man says that the trick in low cost gold plating is to secure a thin uniform plate. Uneven coating of gold is wasteful as it is no better than the thinnest part and yet may carry twice as much gold as if the entire plate were thin and uniform. Steel parts to be gold plated are usually first brass plated, then polished and then gold plated. The recovery of gold from the rinse bath is an important economy.

— 67 —

Ask Help on Lubrication

LUBRICATION problems in a modern machine shop are far from simple and some shop foremen have devoted much time to the study of oil composition and oil behavior under varying conditions. One authority has suggested transferring this burden of investigation to the manufacturers of lubricating oils. This could be done by specifying a definite performance when buying oil. It is the old story of cooperation with those who supply materials. Let these suppliers in on your problems and their added experience may turn the trick to your advantage.



Develops 22-In. 100-Hp. La

DESIGNED primarily to determine the maximum metal cutting capacities of cemented carbide tools in machining a wide variety of materials, the 22-in. 100-hp. Super lathe here illustrated will be recognized as a departure from usual lathe design.

With its 100-hp. input, 140 spindle speeds ranging from 33 to 1200 r.p.m., and its weight of 40,000 lb., this machine far exceeds in power, range and rigidity the average lathe of comparable swing, which usually has a power input of 15 hp., 12 spindle speeds and a weight of 8000 lb.

The machine was built by the American Tool Works Co., Cincinnati, for a large electrical machinery manufacturer, and was on exhibit at the builder's plant for several days beginning March 7, as noted in THE IRON AGE of last week.

Two Separate Speed Ranges

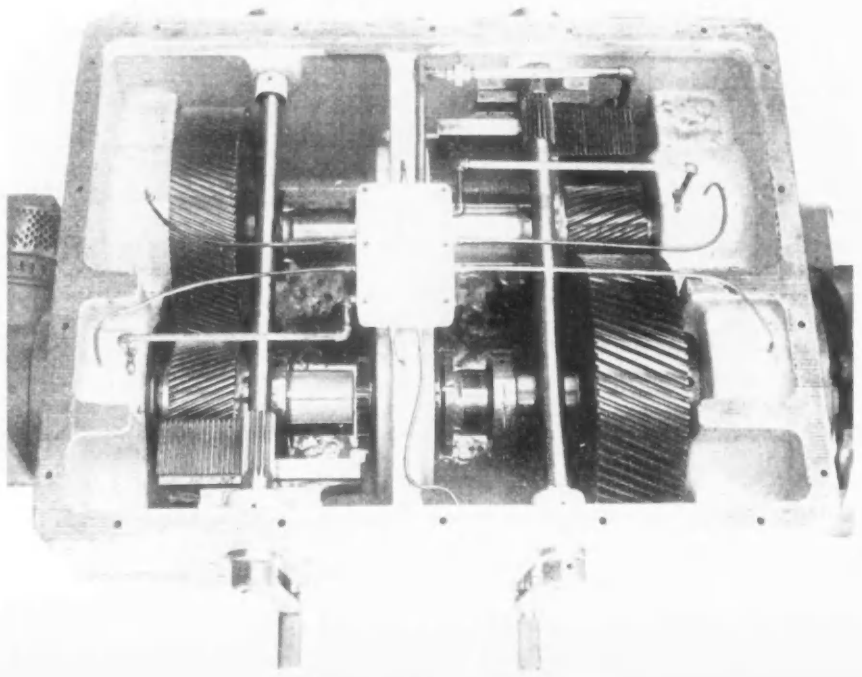
Of several interesting details, the design of the head is perhaps outstanding. Two separate speed ranges are provided; one the high-speed, or direct, range which provides 70 spindle speeds entirely through the 100-hp., direct-current, 6 to 1 motor mounted at the end of the lathe. Control of this range is through the usual type of electrical apron control mechanism with the control handwheel located at the right-hand side of the apron. The second or back-geared range also provides 70 speeds and is secured through four hardened and lapped helical gears, carried by the spindle and one auxiliary shaft.

A feature of the head is the automatic interlock for preventing the change from direct to back-geared speeds without first stopping the motor. The purpose of this is to eliminate the possibility of accident. This interlock is accomplished through the combination of one mechanical and two solenoid locks which will not release as long as there is current in the motor.

To provide maximum rigidity, the headstock bowl is cast integral with the bed and is heavily walled and thoroughly ribbed. A heavy central rib supplies an intermediate or third bearing for both the spindle and the auxiliary shaft. These two shafts are mounted on large twin Timken precision bearings at both ends and at the center.

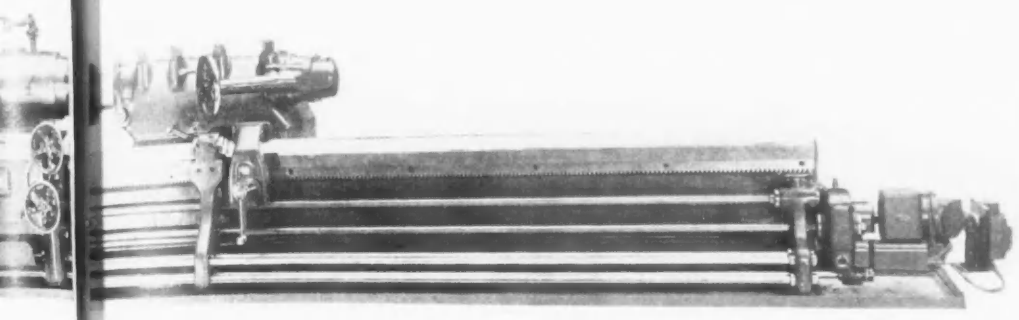
The headstock lubricating system is entirely automatic. A motor-driven pump forces the oil from the 16-gal. tank in the headstock bowl through an oil filter to the central distributing tank; from the latter filtered oil is distributed through individual gravity tubes to all headstock bearings and through cascades to the gear teeth. Indicators are provided to show both the volume of oil in the pumping tank and the flow to the central distributing station.

To assure adequate strength and rigidity the bed is made with a closed top, providing a complete box section; it is further strengthened by ribbing and numerous cross girths. The bed is made of close grained semi-steel having a tensile strength of 47,000 lb. Carriage guides, consisting of one very large 90 deg. Vee and one smaller one at the front and a flat 5-in. wide at the rear, are faced with hardened steel strips to minimize wear. The rear flat guideway is dropped considerably below



▲▲▲ THE contact points of the three jaws of the follow rest, shown above, are tipped with tantalum carbide.

TWO separate spindle speed ranges are provided, 70 changes directly through the motor and 70 through back-gears, or 140 changes in all. Headstock lubrication is entirely automatic. ▲▲▲

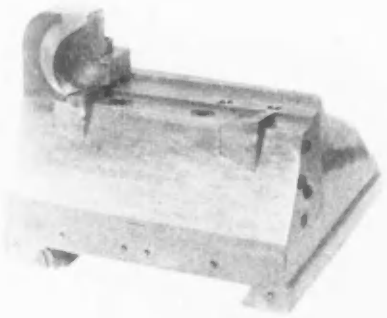


Hp. Lathe to Use Carbide Tools

the front vees to facilitate chip disposal.

Massiveness features the carriage. The bridge, in the form of a heavy box section, is deep and wide. The carriage bears full length on both of the front vees with an auxiliary bearing for side thrust against the vertical wall of the inner vee. The rear wing has a full length bearing on the flat way at the rear. Clamps under the front vee and flat rear way together with a taper gib under the second vee provide adequate compensation for wear, and assure maintenance of a snug fit.

The carriage bridge is extended sufficiently at the rear to accommodate a rear tool rest if desired, in which case two separate cross-feed



screws, each with tempered bronze compensating nuts, are supplied. Lubrication of all carriage bearings and cross-slides is by means of a "one shot" system contained in the apron. A bull's eye in the carriage wing shows the volume of oil in the tank. Shear wipers are provided at each end of the carriage bearings and the second vee is further protected by a pair of telescopic dirt guards.

Heavy steel plates form the front and rear walls of the massive box section apron. Gears are made from nickel-steel forgings and are hardened. Anti-friction bearings are used throughout. The shafts are heat-treated and are multiple splined. Lubrication is by means of the "one shot" oiling system.

Cross and longitudinal feeds are engaged through saw tooth clutches actuated by drop handles and held in engagement by heavy compression springs. A motor-driven power rapid traverse mechanism is furnished as an integral part of the apron, a reversible 2-hp. motor mounted on the bed at the tailstock end being employed. Through a multiple-splined driving rod, power from the motor is transmitted to the bevel gear driving unit in the apron; control is by a lever at the left-hand side which operates a reversible controller.

THE chip breaker, shown at left, protects the operator and facilitates chip disposal. It has a tantalum carbide insert.

▲ ▲ ▲

CHIP disposal at the rate of 15 cu. ft. per min. is provided by the motor-driven chip conveyor shown at the right. The slope of the bed and chip pan directs the chips into the conveyor.

▲ ▲ ▲

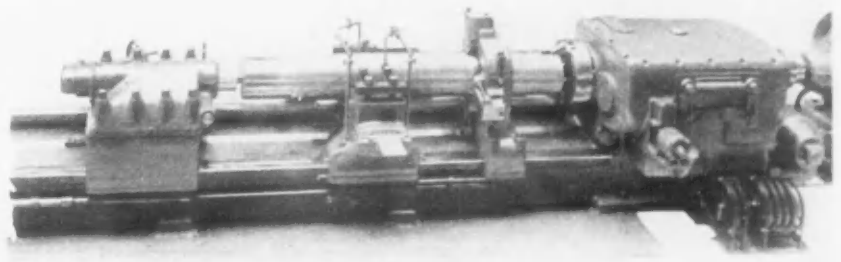
ARRANGEMENT of the rear of the 22-in. 100-hp. lathe is shown in the view below.

Manual carriage traverse is disconnected automatically when the power rapid traverse is in use. This is accomplished through a clutch unit between the manual traverse handwheel and the actuating mechanism in the apron.

The type of tool rests supplied depends upon the kind of work to be done. The front and rear rests on the lathe illustrated are steel blocks with a 2 x 2½-in. tool capacity. They are provided with four large studs and two heavy steel straps each for holding the tools; the tools seat on hardened serrated steel plates. Full-length taper gibs provide for wear adjustment and telescopic dirt guards between the rests, combined with oilers and wipers at each end, prevent damage from chips and dirt. An auxiliary front rest for holding vertical tools is also furnished.

To prevent injury to the operator from red-hot flying chips, a chip-breaker and controller has been developed. This device breaks up the chip into small sections, and deflects it into the chip conveyor.

The tailstock weighs 4000 lb. as against the 250 lb. of the tailstock regularly furnished with a standard



22-in. lathe. It has a full length bearing on the front inner vee and on the wide flat way at the rear. Eight large bolts bind it securely to the bed. A 7½-in. diameter heat-treated steel spindle with built-in roller bearing center is housed in the massive barrel and actuated by a heavy buttress thread screw and heat-treated bronze nut. A large ball bearing is supplied for the thrust and powerful double plug binders for locking the spindle. Traverse of the tailstock unit along the bed is accomplished manually through a gear mechanism actuated by a crank. In addition, a link connection to carriage is supplied so the tailstock can be moved in conjunction with the carriage through the power rapid traverse mechanism.

Feed Mechanism Independent of Spindle

The feed mechanism of this lathe is entirely separate and functions independently of the lathe spindle. It is driven by a 6 to 1, 3-hp., adjustable-speed motor located at the headstock end of the bed, and through a 50-contact rheostat and a two-speed mechanical unit it provides 100 rates of carriage feed, from 1¼ to 43½ in. per min. A handwheel, a revolving pointer and graduated dial control the motor speed and indicate the rate of feed. The mechanical two-speed unit, also located at the headstock end, forms the connection through a worm and worm wheel speed reducer and a geared speed change mechanism to the 2-in. multiple-splined feed rod.

The entire feed mechanism is mounted on anti-friction bearings, and all gears are hardened and run in oil. A hardened jaw-clutch in the mechanical speed-change unit provides the disconnecting element for the automatic feed trip, which operates through an adjustable stop collar on the feed rod and a contacting plate on the apron. The carriage feed can be tripped automatically at any predetermined point without stopping the motor.

Conveyor Provides Rapid Chip Disposal

A motor-driven chip conveyor that operates at a speed of 40 ft. per min. and has a chip disposal capacity of 15 cu. ft. per min. was designed for the machine. Due to the slope of the bed and chip pan the chips fall directly into the conveyor, which in turn deposits them into the removable collector bucket set into the foundation pit at the end of the conveyor.

A heavy box-framed steel follow rest with a capacity of 1½ to 7 in. is attached to the right-hand face of the carriage bridge. The three round jaws of this rest have their work contacting ends tipped with tantalum carbide to resist wear. The steady-rest, also made of steel, has a 15-in. opening; the rollers of its four jaws are mounted on Timken bearings.

Production Lathe Using Carbide Tools Has Speeds Up to 2400 R.P.M.

THE R. K. LeBlond Machine Tool Co., Cincinnati, has completed an extra heavy-duty rapid production lathe, with Timken helical-geared head, developed for the use of cemented carbide tools. The design differs in many details from that of the usual production lathe. The machine is driven by a 25-hp, variable-speed motor and has spindle speeds ranging from 150 to 2400 r.p.m. The speeds from 150 to 600 r.p.m. are obtained by driving through a set of back-gears and those from 600 to 2400 r.p.m. by a direct drive to the spindle. A six-sheave V-belt drive is employed.

The driving pulley is supported between two Timken bearings, the outboard bearing *A*, Fig. 2, and the bearing *B* in the headstock. The former is mounted in an extra heavy bracket, *C*, to assure accurate alinement of the pulley under severe operating conditions. When the spindle is driven direct, the gear *D*, Fig. 3, is shifted to the right, acting as a splined coupling between the drive shaft and the spindle *E*. This construction prevents the driving pulley load from coming directly on the spindle and thereby causing undue vibration and wear.

When the gear is in the direct drive position, the flanges *G* and *F* are in line, making it impossible to engage the back-gears. When the back-gear train is to be used, the gear is shifted to the positions shown in Fig. 3, and the back-gears are meshed by means of lever *K*, Fig. 2. So that helical gears can be employed without the disadvantage of excessive end thrust, gear faces are exceptionally wide. The spindle is unusually large and is mounted in two Timken bearings, *L* and *M*, Fig. 3. The spindle is shorter than usual, thus eliminating any tendency to deflect under severe operating conditions.

All headstock bearings are force lubricated, the oil being pumped from a reservoir, located in the bed directly under the head, through an oil filter to the bearings. This insures a constant supply of clean oil and reduces to a minimum the possibility of high bearing temperatures.

Feed gears are in the headstock and are mounted on Timken bearings. Nine feed changes, ranging from 0.002 in. to 0.025 in. per revolution, are available. The feed rod, *Q*, Fig. 1, is mounted on two Timken tapered bearings at *R* and on a straight roller bearing at *S*. The automatic length stop, *T*, consists of a positive clutch which is disengaged by a boss on the apron engaging an adjustable trip dog, *V*, on the controller rod.

The bed is a heavy semi-steel casting equipped with hardened and ground Nitralloy ways. The entire front shear is of Nitralloy and the rear shear is a heavy hardened Nitralloy plate mounted on the bed. This feature prevents the bed wearing in the sections where it is most used. The apron is an extra-heavy box-type casting equipped with an oil pump which automatically lubricates the shears, cross-slide and cross-feed screw bearings. The first stud and rack stud are mounted on ball bearings to eliminate friction loss at these points.

The taper attachment is of new design. The guide bar is made unusually rigid by being reinforced with a heavy rib. Accurate alinement of the guide bar shoe is insured by locating

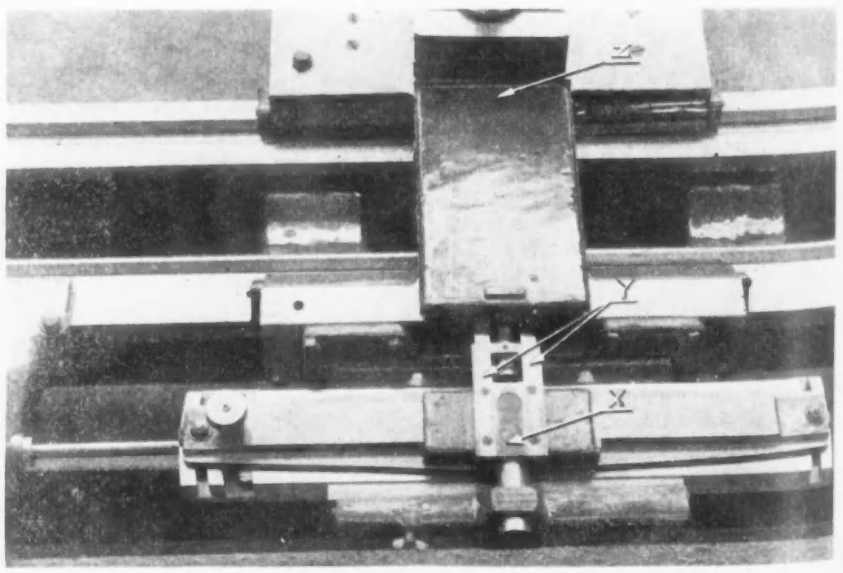


Fig. 4.—The taper attachment is of new design. When close accuracy is required the draw-bar is clamped through nut *Z* for the finish cut.

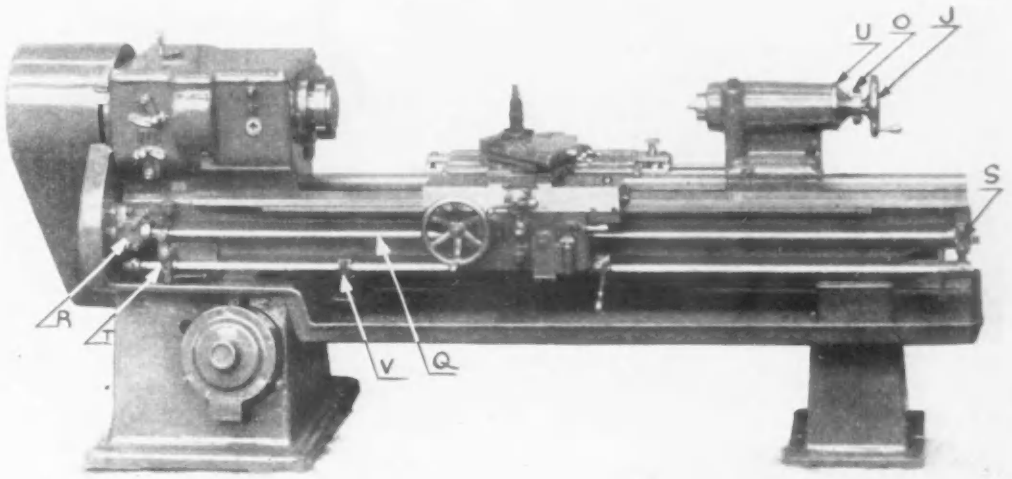


FIG. 1.—The design of many details of this LeBlond lathe, developed to use cemented carbide tools, differs from that of the usual production lathe. The machine has a swing of 16 in. and is driven by a 25-hp. variable-speed motor. Speeds ranging from 150 to 600 r.p.m. are obtained through back-gears and those from 600 to 2400 r.p.m. by a direct drive from the spindle.

the bar near the center of the cross-feed screw and supporting it by the carriage shoe, *X*, Fig. 4, which is held between two bearings. The telescopic feed-screw is connected to one end of the carriage shoe. Two ball thrust bearings are used for this connection, hence there is no backlash at this point.

Two draw bars, *Y*, are connected to the carriage shoe, extending under the cross-slide to a clamp located in front of the compound rest. When tapers are turned and more than one cut is desirable, this construction makes possible the use of the cross-feed screw to adjust the depth of the cut. If a precision finish is not desired, it is not necessary to use the draw bars; if close accuracy is required, the operator can clamp the draw bars by means of the nut *Z* for the finish cut.

The extra wide square-type compound rest has an unusually large bearing when swiveled to any position. It is clamped to the cross-slide by four bolts instead of the usual two. The carriage cross-slide is equipped with hardened slides.

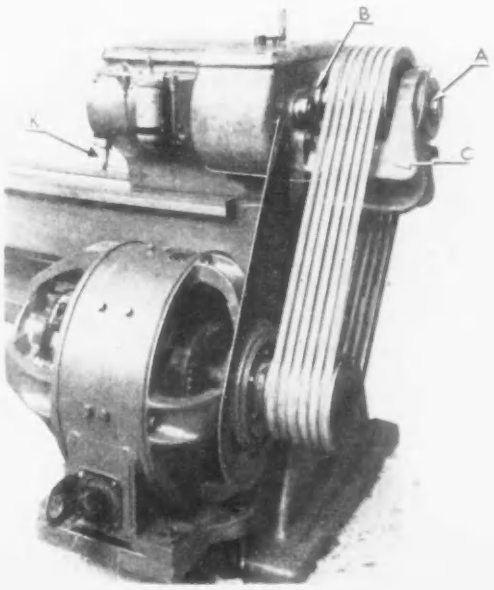
Of special construction, the tailstock has a hardened and ground spindle sliding in a hardened sleeve, which is pressed in the extra heavy casting. This prevents wear and insures accuracy for the life of the machine. Since the usual type of clamp is impractical, a specially designed one is used to locate the spindle in position. It consists of the unit *O*, Fig. 1, which is a ratchet mounted on the screw bush, *U*, and a pawl in the unit *O*. Thus the spindle screw cannot back off and allow the center to loosen. A trip dog on the handwheel *J* releases the pawl when it is desired to withdraw the spindle.

Spiral Bevel Gear Data

The history, method of cutting and particular advantages of spiral bevel gears are outlined in an attractive 12-page booklet published by the Gleason Works, Rochester, N. Y. Profusely illustrated, the publication gives data on strength, wearing qualities, efficiency and other general characteristics of interest to engineers and machine designers.

Germany Applies Tariff on Used Machinery

WASHINGTON, March 29.—Effective March 27, a German Government decree established an export duty of 800 reichsmarks per 100 kilos on certain used machinery and used machine parts, including textile machinery, wood and metal-working machinery and other machinery not specified in the tariff. The cablegram from Commercial Attaché H. Lawrence Groves, Berlin, to the Department of Commerce advising of the decree, said that it was reported to be a measure intended to restrict industrial migration abroad and to avoid the dislocation of machinery markets.



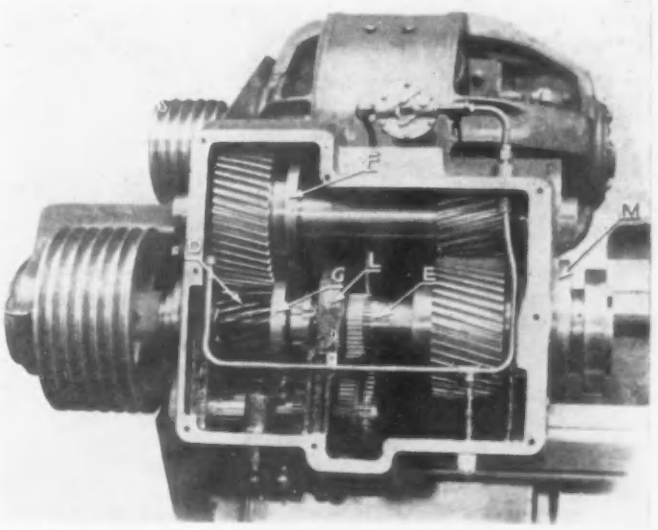


Fig. 2 (at left).—The driving pulley is supported between two tapered roller bearings.

Fig. 3 (above).—The faces of the helical gears in the head are unusually wide, and the spindle, mounted in Timken bearings, is unusually short, eliminating deflection under severe operating conditions.

MYRON C. TAYLOR

Hold Fast to Established Principles

By MYRON C. TAYLOR

TIME-HONORED precedents in situations like the present are worthy of utmost respect, and new panaceas should not distract our minds from fundamental truths. We cannot rebuild the economic world over-night, and if we could do so it is open to very grave question whether we would make a better job of it. There are some principles which seem to be firmly established by tradition and to retain man's confidence. The law of supply and demand still functions.

In considering some of the causes affecting supply and demand, it must be borne in mind that, because of the application of science and of changes of fashion in form, character, and quality, ofttimes ephemeral, industry is ever in a state of flux. Without change there cannot be progress, but often change carries with it destruction of obsolete methods and machines and an accompanying disturbance in human relations as the price that every industry has to pay if it is to avoid decadence.

Artificial Price Fixing Is Uneconomic

In the endeavor to find a solution of our present troubles many plans have been advanced, some of them palliative, some constructive, but unfortunately, many ill-advised and destructive in character. The latter, like the nationalization of industry and the artificial fixing of commodity prices through attempted stabilization by Governmental control, invite defeat at their inception because they are contrary to the law of supply and demand.

In a competitive organization of society the law of supply and demand is a principle of economics. It is unwritten and is economically supreme. It is based on instincts and desires of the average man, which are innate and have been unchangeable since the dawn of history, such as the love of life, the love of family and the love of possession.

It cannot be too strongly emphasized that, if any plan for the amelioration of our present economic difficulties does not harmonize with this great law, it is due to fail. Basic supply and demand conditions inevitably regulate prices in the long run. Artificial measures looking toward price control are sure to break down eventually.

Self Interest Strongest Incentive to Stabilization

Nostrums which undertake to interfere with the even flow of trade and the law of supply and demand will ultimately bring a severe penalty in their wake. Even if we could upset for the moment the working of this great underlying principle, we would pay doubly for it at a later day. We would only postpone the inevitable crash that would follow. On the whole, the working out of this relation between supply and demand will be most effective if guided by the responsible individuals directly concerned, since their self interest acts as the strongest incentive to rationalization and stabilization of the economic system.

If we lived in a static condition, where production and demand were always in perfect step, there would be no room for initiative and for adventurous youth to try its hand at enterprise. Theorists have attempted to set up all sorts of formulæ that would take from life most of its uncertainties. They do not realize perhaps that they would take out of life its chief elixir, the element of competition, and would eliminate profit, which is the reward for the energetic and patient and far-sighted; they would tend to make life humdrum.

From the outset, our national industrial development has been aided greatly by the protective tariff policy. This system has become part of the bone and sinew of our national economy. We have prospered under it—a few would say in spite of it—and our industrial structure is now completely adjusted to the protective tariff system. As the result of this tariff policy we have set up an artificial state in which all values are based upon protection. The value of our labor, the value of our physical properties, the value of the securities issued against our properties, of lands and structures of all sorts, rests fundamentally upon a cost of production, augmented by a protected labor market, that is higher than that of any other country. If in a moment of fright we should tear down those tariff barriers behind which we have built this great nation, we would destroy our economic safeguards.

Exports Smaller Than in 1900

In any event, whether we maintain or modify our existing tariff structure, a decline in foreign demand for American products seems likely to occur because of the rapid extension of foreign tariff barriers, which is already having a marked effect on our export trade. In recent years, there has been apparently a great increase in our export trade, but this increase is, in large measure, an increase of price rather than of quantity. Measured by quantity, the proportion of the national output of movable commodities that is exported—the products of our farms, our mines and our factories—is less than at the beginning of the century and about the same as immediately before the World War.

This condition has resulted from the fact that, with its abundant resources, the United States has been able to increase rapidly its domestic production, while, at the same time, a growing population has been able to absorb the great bulk of this increased output.

There are, however, indications that the growth of the domestic demand may slacken, for we are ap-

aching a period when, by reason the reduction of immigration ough restrictive legislation, and ened opportunities for employ-nt, and of a further decline in the th rate, a comparatively stationary gulation may be reached in the ited States in the course of a few cades.

Controlled Production Inevitable

Such a situation would naturally d in the direction of controlled pro-ction in our industrial life. If at the same time our export trade, which recent years has represented about per cent of our total production, sumes pre-war proportions—that is say, if our exports decline to the erage of the period 1900 to 1914, when our foreign trade balance aver-aged about $488,000,000 a year—a ntrol of productive activity would em inevitable, unless some large, w internal consumption demand hould arise. Under the influence of the World War, when our products were in great demand, our foreign rade balance rose in the years 1915 o 1920 to an average of $3,163,000,-000; but we could hardly expect that nder any other circumstances such high trade balance could be long maintained. In fact in the period 921 to 1930 our foreign trade balance eclined sharply to an annual average of some $850,000,000 a year.

Redistribution of Work and Reduction of Hours in Prospect

Controlled production may be ex-pected to come about automatically as our surplus stocks become ex-hausted and as competition, spurred by necessity, discards obsolescent pro-duction equipment and adopts a justi-fiable price control that sacrifies some part of production volume to secure reasonable price levels for commodi-ties. This also will bring about a re-distribution of work and a readjust-ment of living conditions throughout the country, which in industry will mean a reduced working period and a consequent greater leisure for the in-dividual.

Those unwilling to work under the conditions thus offered, it would seem, would follow the natural impulse of moving to smaller communities and cultivating the land for individual sustenance. Out of this simplification and rearrangement of life, with ac-cumulating savings from rationalized productive activity, there would arise a growing demand for products old and new and with it a demand for workers, leading, it would seem rea-sonable to believe, to a new phase of the cycle of economic development. Ultimately, we should reach once more a period of enlarging prosper-ity as has similarly been the case following past business depressions.

It is difficult to see how in the pres-ent situation the large numbers that have migrated to the cities can all be given work at fair compensation. On the other hand, our vast and produc-tive land areas offer opportunity for a more widely distributed, self-sus-taining population. We can lead full, rich, and beautiful lives without crowding together in huge cities. We may enjoy all the benefits of inven-tion without traveling the rapid pace of urban life. And so, it would seem that our thoughts and efforts should be directed toward the readjustment of production and the reallocation of population, rather than to the conjur-ing up of artificial stimulants for inflation whose reactions might be even more distressing than the mal-ady from which we are now unfor-tunately suffering. Neither should we undertake to let down the protec-tive barriers, which would inevitably reduce the quantity of available work, the compensation of the worker, and the standards of living.

Specific remedies have been applied, and often very wisely, to definite weaknesses in our structure, partic-ularly in our financial structure. Our business leadership should be given great credit for courageous action and our governmental bodies should equally be given credit for timely and non-partisan cooperation in bringing about these necessary adjustments. In addition to these measures, how-ever, the patient of whom we are speaking, the individual in his per-sonal relation to the economic life of our time, must help himself, must dis-play intelligence, and must make a real and personal effort to overcome his afflictions.

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IN a recent address before the Boston Chamber of Commerce, here abstracted, Myron C. Taylor, chairman of the board, United States Steel Corpn., sounded a warning against nostrums and urged adherence to time-honored precedents.

Artificial price fixing, he states, will lead to disaster, but controlled production will come about automatically through the replacement of obsolescent production equipment and the voluntary sacrifice of business volume to secure stability.

He emphasizes three main points: the danger of tampering with the law of supply and demand, the need of tariff protection and the necessity of reducing our excessive tax burden.

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There is no single remedy for the economic ills from which we are suffering, nor is there any valid reason for assuming that tariff reduction would even contribute to the cure of those ills. In the present period of business uncertainty any such policy would add a new element of uncertainty.

The Evil of Excessive Taxation

One of the causes of the present depression and one of the difficulties which confronts us in the restoration of normal activity is the enormous, world-wide burden of taxation which, irrespective of the increase due to the war, has otherwise been growing rapidly. The total governmental debt in this country was in 1913 $4,200,000,000 or $43.70 per capita; it was in 1929 $30,352,000,000 or $248.46 per capita. The total cost of government, which was nearly three billion dollars in 1913, was in 1929 more than thirteen billion dollars. While the cost of government has thus been increasing by leaps and bounds, our population has increased about 27 per cent in the same period.

Tax Burden Has Doubled

A recent report of the National Industrial Conference Board indicates that in the United States taxes have risen from $22.66 per capita in 1913 to $80.30 in 1929; that the percentage of taxes to total national income has risen from 6.4 per cent in 1913 to 11.5 per cent in 1929—or almost double.

The expenditures of the Federal Government in 1913 were $692,000,000; in 1929, $3,932,000,000. Expenditures of State and municipal governments in 1913 were $2,227,000,000, whereas the State governments alone in 1929 spent $1,990,000,000 and municipal governments $7,126,000,000. The total per capita expenditures for government—Federal, State and municipal—in 1913 were $30.24, while in 1929 they were $107.37.

It is sometimes not sufficiently realized that what is taken from the people for the support of our municipal, State and Federal governments must, directly or indirectly, come from the pockets of every individual and reduce the amount available for labor, commerce and industry. It is too frequently assumed that taxation is an obligation for the capitalistic class to bear and does not concern the wage earner.

The term capitalistic when applied to a nation like the United States has fortunately a broader significance than as a mere reference to an economic philosophy. As regards this country, this appellation recalls the fact that the nation's capital primarily lies in the hands of the man of moderate means and not in those of the superlatively rich. As bearing upon this point, it is estimated that last year there were seventeen million owners of stocks and bonds in the United States who were, therefore, partners in our various corporations.

Another index of our wide distribution of wealth is the number of the country's depositors in savings banks, which grew from eleven and one-quarter million in 1913, with accumulated savings of eight and one-half billion dollars, to fifty-three and three-quarter million with savings of twenty-eight and one-half billion dollars in 1930. This does not, however, take into account the almost equally large sums represented in savings made through building and loan association deposits and premiums paid for life insurance.

Balanced Budget Essential

The character of any nation is but the composite character of its people, and a cross-section of their condition pictures the condition of their country as a whole. As with any individual, the financial well-being of any nation is dependent upon its thrift and economy. A balanced budget is as mandatory as is the current paying of one's bills, if continuing prosperity is to be insured and if there is to be avoidance of such financial stress as we see around us.

Because of the enormous private and public extravagance in which we have indulged of late, and the false gods we have followed, the time has come to call a halt, to take stock, to restore our sanity, individually and collectively. The hard knocks of necessary readjustments that we are taking will no doubt prove ultimately to have been the only cure for those ailments from which we in our vanity, in our over-indulgence, and in our intoxication have been suffering, and which would have led us along a troubled road to ultimate ruin.

Now we are facing reality again. And what is that reality? The things that were conceived in selfishness and born of arrogance have returned to the dust from which they came. So it has been in the past, and so it will always be. The splendors of Egypt and Assyria, the pride and pomp of Rome, the aggrandisement of France under Napoleon, the dream of imperial Germany,—all vanished. But whatever of beauty and truth these things contained are yet with us, bannered in our skies and reflected in our souls.

We have learned that the false gods of our ideals, the gods of size and speed, have proved powerless to help us. Bigness has afforded us no lasting happiness, and speed no economic security; hastily gained knowledge no wisdom, and swiftly moving pleasures no serenity. We should reaffirm our faith at the altars of simplicity, sobriety and a better human understanding!

Shipments of electric industrial trucks and tractors in February totaled 26 units, compared with 29 in January, according to reports made to the Bureau of the Census by 10 leading manufacturers.

Foreign Steel Prices Disturb M

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SIXTY or more of the leading industries of the United States will provide organized support of the Hawley bill, now before Congress, which would equalize tariffs on imported products by compensating for depreciation of foreign currencies. The bill provides that an additional duty be levied if the value of the currency of any foreign country from which goods are received is 5 per cent or more below the standard value of such currency as proclaimed by the Secretary of the Treasury on Oct. 1, 1931. The duty would be equal to the difference between the standard value of the foreign currency and the depreciated value.

Hearings on the bill probably will be begun in Washington about April 15 before the Ways and Means Committee of the House. No definite date will be set until the House has disposed of the tax bill, following which there will be hearings on the bonus bill. Then the Hawley bill will be taken up.

The National Emergency Committee, which was organized on Feb. 24 by about 65 industrialists of the country, representing 30 of the leading industries, with Carl E. Whitney, 15 William Street, New York, as chairman, will take an active part in the support of the Hawley bill. The steel industry will be represented at the hearings in Washington on the bill, though whether the representations will be made officially through the American Iron and Steel Institute or through individual companies has apparently not been definitely decided. In any event, a good many steel companies will present specific information on the new form of competition that has come about in the steel business through imports from countries whose currencies are depreciated.

In its preliminary work in support of the Hawley bill, the National Emergency Committee has enlisted the support of a total of about 60 of the country's leading industries, and the number may reach as many as 75 before the Washington hearings are begun. It is said that seldom in the history of Congressional legislation has there been so substantial a backing for a bill as will be offered in behalf of the Hawley measure.

Steel Industry Exercised Over Low Foreign Prices

Although total imports of iron and steel have been falling off in recent months, the steel industry is exercised over the prices that are being quoted rather than over the quantities that are coming in. A somewhat extreme case is the sharp rise in imports of steel strips from Sweden. In December, 1930, the imports of this grade of steel from Sweden amounted only to 3419 lb., with a value of $798, or 2.33c. a lb., while in December, 1931, imports of this product from the same country had multiplied more than 27 times to 93,852 lb., valued at $18,983, or 2.02c. a lb., a decline of $6.20 a ton, due entirely, it is said, to Sweden's depreciated currency.

An importer of Swedish iron bars states that before England went off the gold standard the price paid, delivered in this country, was 4.42c. a lb. Recently these bars have been bought at 3.14c. a lb., a decline of $25.60 a net ton. This importer has recently bought foreign reinforcing bars at 1.10c. a lb., delivered at his warehouse, including a charge of $1 a ton for trucking, or approximately $14 a ton below the price at which he could buy domestic reinforcing bars laid down at his warehouse.

The market for steel floor plate has recently been severely injured, steel companies state, by imports, some of which are a direct copy of the specially designed patterns of American floor plate producers. The domestic price on floor plate has been the base price on sheared plate plus an extra of $1.75 per 100 lb. On this basis, the delivered price of domestic floor plate at New York was about 3.55c., including freight rate from Eastern mills. Foreign floor plate of identical pattern has been offered in the New York market at prices ranging from 1.70c. to 2.10c. a lb.

One of the most disturbing of the recent foreign purchases was that involving tin plate. Some of the canneries on the Pacific Coast bought a quantity of Welsh plate, said to total about 250,000 base boxes, at prices approximating $3 per base box, duty paid, against a domestic official price of $4.75. These tin plate imports, which are beginning to come in, have been particularly upsetting because of the fact that the sale of cans throughout the country is predicated on a stable tin plate price over the entire crop harvesting season, thus permitting one section of the country which packs its crop early to be assured of the same price for cans that will be paid a month or two later by canneries in other sections of the country. Although no further sales of Welsh tin plate for shipment to this country are expected, owing to the sold-up condition of the Welsh mills

urb Markets; Steel Industry to Support Hawley Bill

and the output restriction program now in effect in that industry, the facts about the sales that have been made probably will be presented to the Ways and Means Committee as an argument in favor of the passage of the Hawley bill.

English makers of cotton bale ties have recently offered them for sale in this country at 75c. per 45-lb. bundle, the lowest price in many years, and one that is due largely to England's depreciated currency.

Iron and Steel Imports Declined in February

Total imports of iron and steel in February, according to Department of Commerce records, were only 26,738 tons, a decline of 4315 tons from the January total, while the amount brought in during both January and February was less than the total for the corresponding months last year—57,785 tons this year, against 69,673 tons last year. However, the prices now being quoted to the importers and by the importers for resale are lower than a year ago, and it is the price situation that is most disturbing to the American steel trade. Stocks of foreign steel in New York City warehouses alone are said to total more than 12,000 tons, one warehouse having about 4000 tons and two others about 2500 tons each. Of 47 steel warehouses in the New York district, it is said that not less than 33 carry some stocks of foreign steel. Only about 10 handle domestic steel exclusively, while at least four have stocks only of imported steel. In many instances incoming shipments of steel are stored on the piers and moved in lots of 1000 lb. or less to consumers and jobbers in the New York district.

Competition of foreign bars has been particularly felt in the concrete reinforcing trade, more so in road work than in building construction. The size commonly used for concrete paving is ⅜ in., on which the American mills charge an extra of 40c. per 100 lb., whereas there is no extra for this size on foreign steel.

Among the companies in New York which have been particularly active in the importation of European steel are the Petrometal Corpn., 33 West Forty-second Street; Winter, Wolff & Co., 401 Broadway; Manealoff & Co., 75 West Street; Ferrostaal, Inc., 40 Rector Street; Simon & Mills, Inc., 25 Leonard Street.

Pig Iron Markets Also Affected by Imports

Eastern pig iron producers have also felt the effects of foreign competition more severely than at any time in years. In pig iron, as in steel, the quantity of the imports is not so serious as the prices that are being quoted. However, 5734 tons of foreign pig iron came in during February, and the total for the first two months of this year was 15,103 tons, against 14,597 tons during the same period last year. Of this year's imports, the bulk has come from The Netherlands and India. Of the 15,103 tons received in two months, 9732 tons was from The Netherlands and 4157 tons from India.

Buffalo furnaces are much concerned over the situation. In New England they have been unable to obtain satisfactory prices recently in competition with foreign iron. Imported iron has been sold in New England at prices that figure back to about $13.75 a ton, on cars at Boston. Foreign iron is being offered in the New York district at $14.30, f.o.b. Hoboken, N. J. On large lots, lower prices are said to have been quoted. A strange part of the situation is that Eastern steel plants, whose markets for steel are affected by foreign competition, have recently been purchasers of foreign pig iron.

In Texas and California foreign steel is to a large extent dominating the market on certain products, particularly bars. Texas buyers of foreign steel take the position that the State must sell a considerable portion of its cotton crop abroad, and that therefore, on a reciprocal basis, foreign steel purchases are quite logical, especially in view of the fact that most of the American mills are situated at a considerable distance, making the delivered prices considerably above those of the imported material.

Belgium has recently been the principal source of the foreign steel coming into the United States. According to the Department of Commerce figures for February, merchant steel bar imports in that month were 3195 tons, of which 1731 tons came from Belgium and 1000 tons from Germany. Reinforcing bar imports were 2185 tons, of which 1910 tons came from Belgium. Imports of structural shapes were 2919 tons, of which Belgium supplied 1686 tons, France 607 tons and Germany 534 tons.

A report of the Economic Union of Belgium and Luxemburg, sent to the Department of Commerce, shows that the United States bought from Belgium and Luxemburg in 1931 a total of 99,565 tons, which does not agree with the statistics of this Government, which give a total of 128,653 tons of iron and steel products from Belgium, including 39,063 tons of structural shapes, 26,641 tons of concrete reinforcing bars, 24,337 tons of merchant steel bars, 14,903 tons of ingots and blooms and 11,850 tons of hoops and bands.

Although some of the countries from which imports have been the largest are not off the gold standard, they, in turn, have had to compete in the American market with countries having depreciated currencies, and the result has been a fresh outbreak of price demoralization at a time when the American mills are making a determined effort to stabilize their quotations at a slightly more profitable level.

Pacific Coast Feels Foreign Competition Keen, Particularly on Bars, Shapes and Wire Products

SAN FRANCISCO, March 26.—The foreign steel situation of the Pacific Coast has become rather acute. During 1931 a total of 95,548 tons of steel products was imported from European sources to Pacific Coast ports, according to Government records. This compares with a total of 119,632 tons in 1930, a decline of 20 per cent. However, the decline in

foreign steel was probably less than the falling off of steel consumption as a whole in this territory last year.

It is estimated that 1,250,000 to 1,500,000 tons of steel was absorbed in the Pacific Coast area during 1931. The imported tonnage was only 6 or 7 per cent of this, but imports represented a very large proportion for certain products. Practically no plates or rails are imported and very little tin plate, but the imports of such products as bars, light structural shapes and wire products last year represented from 25 to 40 per cent of the total consumption of these products in this district.

As an illustration of how seriously the Pacific Coast area is affected by foreign steel, it is cited that the incoming shipment of bars, shapes and wire products from foreign sources are from 30 to as high as 60 per cent of the total steel imports of these items in the United States notwithstanding the fact that the Pacific area represents less than 10 per cent of the nation's steel market.

A factor which contributes to large steel imports in the Pacific Coast area is that ocean freighters which carry lumber, agricultural products and canned goods from Pacific Coast ports to Europe, are very anxious for return cargoes, and steel products have been taken in lieu of ballast at rates as low as $5 a ton. This compares with an ocean freight rate from Atlantic ports to Pacific ports of $7 a ton, with an additional charge of $6 a ton for the rail haul from Pittsburgh to seaboard. The high cost of transporting steel from mills in the East more than offsets the duties on steel products.

Reinforcing Bars at 1.30c. a Lb.

In recent months reinforcing bars have been sold by importers in southern California at as low as 1.30c. a lb., with no size extras. It is the current practice of importers of bars and shapes to quote a single price, averaging sizes, rather than to maintain extras or differentials. By comparison, domestic mill schedule calls for a base of 2.10c. a lb.

Although the sources of imported steel vary from time to time, it appears that approximately half the bars and shapes received are from Belgium, a little less than one-third from Germany, and only one-seventh from France. Germany sends practically the entire total of wire products. Two firms of foreign mill agents handle the bulk of the tonnage, one representing the German iron and steel syndicate and the other the French and Belgian federated mills. These two firms book orders and make sales in advance in accordance with standard mill practice. A minor but even more disturbing factor is the activity of general importers and exporters who handle shipments on speculation, attempting to sell cargoes en route, warehousing partial and broken stocks and selling for fluctuating and irregular amounts.

Several years ago, when imported steel first became a factor on the Pacific Coast, estalished distributers and jobbers, as well as most of the fabricators, refused to purchase foreign stocks. As pressure continued, a differential was established between foreign and domestic stocks, and nails, bars and wire products were carried as separate stocks. This resistance on the part of the trade and the sales efforts and low prices of importers encouraged the establishment and partial recognition of a large number of new distributers and specialty fabricators, with the result that there are now in the Far West more mill buyers than at any time in the past, with the smallest volume of total business in recent years to divide.

Identifying Marks Often Removed

Although kegs of nails are plainly marked with the point of origin, the identifying mark on rolls of fencing and barbed wire and on bundles of bars and shapes is simply a tag on the bundle which is easily removed. Imported stocks of the latter commodities are now placed in stock with domestic product and sold without differential or identification. Most municipalities, many large industrial buyers as well as State and Federal purchasing agencies include in their specifications provision that materials must be of domestic origin. This has in some instances protected bidders and suppliers, yet the present practice of absorbing unmarked and unidentified foreign bars and shapes into warehouse and fabricating stocks often evades the intent of the provision.

An examination of the segregated tabulation of imports for the past two years indicates that the trend up to the first of the current year has been toward increased imports of foreign steel. Taking into account the material shrinkage in the total market for 1931 as compared with 1930, it is seen that the quantity of reinforcing bars imported more than doubled, that bars, wire products, railway material and hoops and bands substantially increased, and that the decrease in the total was less than the decrease in the total volume of the market. The most notable decrease was in structural steel, reduced by almost a third. Inactivity in the oil industry accounts for the sharp fall in wrought pipe.

In comparing the totals received in the principal Pacific Coast ports, it is to be noted that principal decreases for the past year, as compared with the year before, were at Los Angeles, and that imports into the ports of the Pacific Northwest were practically the same for the two years.

IMPORTS OF FOREIGN IRON AND STEEL PRODUCTS TO PACIFIC COAST PORTS

(In Tons of 2000 Lb.)

	1930	1931
Reinforcing bars	6,764	16,691
Bars	13,459	14,588
Sheets	19,666	12,172
Structural	34,412	13,104
Wrought pipe	13,588	7,799
Cast pipe	8,797	3,652
Wire proucts	11,636	14,471
Billets, castings, etc.	5,036	4,767
Railway material	1,963	4,114
Hoops and bands	3,034	3,712
Wire rods, plates and tin plate	1,277	478
Total steel products	119,632	95,548
Pig iron (in gross tons)	12,936	9,844

TONNAGE DISTRIBUTION TO PACIFIC COAST PORTS

	Steel Products		Pig Iron	
	1930	1931	1930	1931
Los Angeles	53,660	38,740	4,366	3,961
San Francisco	38,392	32,637	6,238	4,416
Portland	13,758	11,449	412	253
Puget Sound	13,822	12,721	1,920	1,214

"Buy American" Bill Is Introduced in House

WASHINGTON, March 29.—The "buy American" proposal of President Hoover is carried in a comprehensive bill, which was reported to the House of Representatives on Wednesday of last week from the Committee on Expenditures in the Executive Departments. The measure was drafted by Representative Riley J. Wilson of Louisiana. It compels all Government departments whenever possible to buy both raw and manufactured products of American origin and extends to contractors and subcontractors having contracts for any kind of Government work. The only exceptions are where the American costs are unreasonable, and in case of materials to be used for experimental or scientific purposes. If discovered that contractors had not complied with the provisions of the proposed law, they would be barred from doing any other Government work for three years. It is proposed that the law become effective 60 days after its enactment. It would not apply to contracts previously entered into.

The bill, which, it is believed, will be enacted by the present session of Congress, was reported out after the House committee conducted hearings on it and several others of a kindred nature, among them one by Mrs. Florence P. Kahn, representative from California.

In his report on the bill, Representative Wilson points out that while the bill requires the use of American materials where obtainable, it permits the exercise of judgment on the part of a Government purchasing officer or agent in allowing him to purchase goods not complying with requirements if he determines that compliance in a given case is inconsistent with public interest, or if he determines that the cost of complying with the requirement would be unreasonable. Such exercise of judgment would be controlled by his superiors and be subject to review by the comptroller general as provided by law.

OFF THE ASSEMBLY LINE

Ford, General Motors and Chrysler Ready to Open Sales Drive

DETROIT, March 28.

THE automobile industry is about to begin its spring selling drive. The industry's three largest manufacturers—Ford, General Motors and Chrysler—will be found in the vanguard of this offensive to break down the buying hesitancy of the public, and their efforts will be supplemented by other companies, including Studebaker, Packard and Hudson.

Ford will lead the way with the display of its new cars on March 31. Two days later General Motors will exhibit all of its products in 55 cities throughout the United States in its "Work For Many Hands" exposition, and the same day Mr. Chrysler will reveal the Plymouth four, on which he will rely this year to compete successfully against a Chevrolet six and a Ford eight.

The new V eight Ford will be publicly displayed in dealers' show rooms in 200 cities in the United States and Canada on Thursday. It has a 65 hp. engine capable of developing a maximum speed of 75 miles an hour, silent synchronized gear shift, rubber mounted motor, down draft carbureter and carbureter silencer, automatic spark control and a diaphragm type pump which draws fuel from a rear tank. Bodies are longer, heavier and streamlined, with slanting safety glass windshield and rounded roof line. The radiator is of the round V type. Four wheel brakes and newly designed welded steel spoke wheels with large hubs and large tires are standard equipment.

The car has transverse springs and a new rear spring. The mounting strip of the instrument panel as well as the center strip of the hood are of rustless steel. Aluminum alloy pistons are used and cylinder block and crankcase are cast in one unit. New type valves with mushroom ends operate from the camshaft. Connecting rods from opposite pistons are placed side by side on each camshaft throw, being mounted on floating steel bushings babbitted inside and out. The cast aluminum cover embracing the intake manifold forms the top of the engines. The frame is of double drop construction. Thermostat control, which compensates for varying temperature conditions and a valve providing for automatic adjustment according to road conditions, are incorporated in the shock absorbers. The rear spring is mounted on perches at the rear of the axle housings.

Ford will show new cars on March 31.

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Chrysler and Chevrolet have placed second quarter steel contracts.

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Plymouth has set 200,000 cars as its 1932 goal.

The price of the eight is expected to be about the same as or slightly higher than model A, with the four selling at $50 to $70 less. Both cars are being offered in 14 body styles.

Volume Production May Not Be Reached until April 18

Assembled Fords, both eights and fours, have been coming off the line at Dearborn to be shipped to various parts of the country, including the Pacific Coast, where work at branch assembly plants has not yet commenced. A few hundred cars a day are being made; it is likely that the attainment of production on a considerably larger scale will be nearer April 18 than April 4, as matters now stand. Stocks of parts continue out of balance, with a possibility that this condition may not be corrected for some time. Minor changes in the design of parts still are being made, with the result that stories immediately are circulated that major changes are holding up production; for instance, a minor change in the frame construction, involving the addition of a small brace, was the basis last week for one of these recurring stories. It is understood that the actual change was effected in a few hours and that quantities of the braces are being sent to branch assembly plants where they will be affixed to the frames already in stock there.

A local company is manufacturing 10,000 carbureters for Ford on a rush contract specifying completion of shipments in three weeks. Other parts makers, in some cases, are turning out parts under similar pressure. Makers of malleable castings in this district have felt only slightly the stimulating effect of Ford releases. Some critics who assert that Ford has no stock of certain parts on hand forget that releases of these parts have been given in small lots scattered over the last three to four months, but in the aggregate have been sufficient to supply 15,000 to 20,000 cars. Steel commitments continue to be negligible.

Chevrolet is believed to have made about 40,000 cars in March. Its April schedule is uncertain, being dependent on the sales trend. The consolidation of Chevrolet and Pontiac manufacturing activities and of Buick and Oldsmobile, so far as executive direction is concerned, and the merger of the sales management of Buick, Oldsmobile and Pontiac, are looked upon as the beginning of a far-reaching program by General Motors to bring about operating economies and eliminate overlapping lines of cars.

It is expected that the new Plymouth, to be shown next Saturday, will have a 112-in. wheelbase, 65-hp. motor, automatic clutch, double-drop frame of X design, and streamlined heavier body as new features, retaining floating power, free wheeling, silent-second transmission and hydraulic brakes which are found in the current models. Prices will be about the same as during the past nine months. The recently-announced "thrift models" will be continued, selling at $60 and $80 less than the new cars. Mr. Chrysler hopes during 1932 to build and sell 200,000 Plymouths and expects to intrench himself permanently in a safe position in the low-price field.

Since the first of the year Graham has built 6080 eights, surpassing its best previous record (5622) for eights in any entire year. Total production

of the new eights, including those made in December, now stands at 7200.

Chrysler Corpn. closed for its second quarter steel requirements the past week. It is said that the percentage of business allotted to its various sources of supply is virtually unchanged from the first quarter. Chevrolet likewise has placed second quarter contracts for its Detroit plants and now is buying for Flint.

At the new Chrysler plant now being erected on the Pacific Coast fenders and other chassis sheet metal parts usually finished in black enamel will be finished in striking colors to satisfy the desire of Californians for smart appearance of cars. In the matter of finishes, it is said that General Motors is experimenting with lacquer paint jobs on Pontiacs, special bronze and colored bodies having been put through the line at Fisher Body.

OBITUARY

L. W. SPRING, chief chemist and metallurgist for the Crane Co., Chicago, died March 23, after an illness of several weeks. A native of Coldwater, Mich., he received his technical education at the University of Michigan, after which he became associated with Illinois Steel Co. at South Works. Later he served with the Wolverine Portland Cement Co., and returned to Illinois Steel as a metallurgist and superintendent in the plate mill. In 1906 he joined the Crane Co., and served first as chemist and later in charge of the laboratories until 1914, when he was made chief chemist and metallurgist.

He was a frequent contributor to the technical press and to meetings of various engineering societies and prepared the 1931 exchange paper of the American Foundrymen's Association to the Institute of British Foundrymen. Mr. Spring was active in technical committee work of the major engineering societies and was on the advisory committee of the United States Bureau of Standards. Announcement was made in January of the award to Mr. Spring of the gold medal of the American Foundrymen's Association.

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FRED REED SHEPHERD, retired president of Crerar, Adams & Co., Chicago, railroad supply dealers, died March 21, aged 64 years. He had been connected with Crerar, Adams & Co. for 35 years, and was made president in 1922 at the death of his father, Edward F. Shepherd, who had been head of the concern for 54 years.

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FRANCIS S. BUND, assistant manager of the Chicago warehouse of the Jones & Laughlin Steel Corpn., died March 17 at his home in Evanston, Ill. Prior to his connection with the steel company, he had been with the Chicago & Alton Railroad.

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E. J. MCGIVENA, an erection engineer, for 36 years with the American Bridge Co., died March 22 at Evanston, Ill., after an illness of several months. He was 63 years old.

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HARRY M. MYERS, formerly director of personnel of Frigidaire Corpn., Dayton, Ohio, died at Alliance, Ohio, March 20, aged 47 years. Previously he was medical director of the Ohio Brass Co., Mansfield, Ohio, for six years and later associated with the Dayton Malleable Iron Co., Dayton.

L. W. SPRING

He left Frigidaire Corpn. in 1930 to devote his time to writing and lecturing and was the author of a book recently published entitled "Human Engineering."

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HENRY J. WIEGAND, for nearly 30 years production manager, Cutler-Hammer Mfg. Co., Milwaukee, now Cutler-Hammer, Inc., died March 22, aged 58 years. He retired April 1, 1927, because of ill health. Mr. Wiegand was a member of the American Institute of Electrical Engineers and widely known in the electrical control industry.

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HENRY M. LELAND, pioneer automobile and airplane motor manufacturer, died after a month's illness in Grace Hospital, Detroit, March 26, aged 89 years. He learned the machinist's trade in Worcester, Mass., was a toolmaker at the United States Arsenal in Springfield, Mass., throughout the Civil War and later was identified with the Brown & Sharpe Mfg. Co., of which he was made superintendent of the sewing machine department. In 1890 he helped organize the Leland-Faulconer Mfg. Co., maker of small tools, in Detroit, and 10 years later engaged in the manufacture of transmission gears. When the Leland-Faulconer company was merged into the Cadillac Motor Car Co. in 1904, Mr. Leland successively became general manager and president and advisory manager. He was one of the organizers of the National Metal Trades Association.

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MORRIS SLEFKOW, since October of last year identified with the field service of the Bridgeport Safety Emery Wheel Co., Bridgeport, Conn., in connection with the sale of face grinders and other grinding machines, died suddenly in Philadelphia on March 23. Prior to that he had been with the Diamond Machine Co., Providence, for over 30 years.

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W. E. TAYLOR, formerly vice-president and member of the executive committee of the old Republic Iron & Steel Co., died at his home at La Porte, Ind., on March 27, aged 79 years. A native of Cleveland, he began his career in the steel business in that city.

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PERCIVAL CHRYSTIE, chairman of the board of the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., died suddenly at that place on March 28, aged 68 years. He represented the fifth generation of the family which has been in control of the company since it was organized before the Revolution. On leaving school Mr. Chrystie became identified with the company and served in various capacities. He had been vice-president for 16 years before he was made president in 1923, but resigned from active work two years ago because of ill health.

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SAMUEL M. CURWEN, president, J. G. Brill Co., car manufacturer, Philadelphia, died at his home at Haverford, Pa., on Tuesday following a short illness. Mr. Curwen, who was 72 years of age, had spent his adult life in car manufacturing, having entered the employ of the Brill company in 1879 as an apprentice. He climbed the various rounds of the ladder up to sales manager, and then to second vice-president and general manager, which office he assumed in 1903, his election to the presidency having occurred on May 7, 1912. He was internationally known in the car manufacturing industry and widely known throughout this country in many other lines of activity. He was an intimate friend of the late Thomas A. Edison. Besides his interest in the Brill company, he was director of several other corporations.

...PERSONALS...

B. S. STEPHENSON has been made vice-president of the American Radiator & Standard Sanitary Corpn., New York. His duties will continue to deal with raw materials and purchases for the corporation. For several years Mr. Stephenson has been connected in an official capacity with the raw material subsidiaries and affiliates of the company, being president of the Humphreys Coal & Coke Co. and the Ideal Supply Co., and vice-president of the James Mining Co. and the Tonawanda Iron Corpn. A graduate of Ohio State University, Mr. Stephenson spent the early years of his business career in daily and trade journalism. In 1910 he became associated with the M. A. Hanna Co. and served consecutively as its resident manager at Pittsburgh, Cincinnati and Detroit, handling principally pig iron, iron ore, coal and coke. During the war he served the Government as a "dollar a year" man at Washington, having been connected with the War Industries Board in the allocation of pig iron. In 1926 he became director of purchases of the American Radiator Co. and, following the formation of the American Radiator & Standard Sanitary Corpn., served as chairman of its purchasing agents' committee. Mr. Stephenson is a member of the American Iron and Steel Institute and the Engineers' Club, New York, and is a past national president of the Ohio State University Alumni Association.

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E. P. BLANCHARD was elected to the board of directors of the Bullard Co., Bridgeport, Conn., at the annual meeting of the stockholders on March 16. Mr. Blanchard has been connected with the company for 12 years, first as advertising manager and then as sales manager, and has a wide acquaintance in the metal-working industries. For several years he has been actively identified with the production division of the Society of Automotive Engineers and with other societies and associations, contributing several papers and discussions to the meetings of those organizations. He has also been the author of several articles appearing in trade, engineering and other publications.

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GEORGE P. TORRENCE was elected president of Link-Belt Co., Chicago, at the fifty-eighth annual meeting of the stockholders. He was formerly vice-president in charge of the company's Indianapolis operations. Mr. Torrence was graduated from Purdue University in 1908 and has had 23 years' experience in various departments of the company which he now heads. After graduation he spent a year in Arkansas with the Sweet & Lord Tie Co. Then came a three-year shop apprenticeship course in the Pittsburgh shops of Westinghouse Air Brake Co., following which, in 1911, he entered the employ of Link-Belt Co. in Indianapolis as a sales engineer. In 1913, Mr. Torrence was placed in charge of merchandise and chain sales in the company's Western division, with headquarters in Chicago. In 1920 he returned to Indianapolis as sales manager of the Ewart Works. In 1925 he was made general manager of both the Dodge and Ewart plants and in 1928 was elected to the vice-presidency of the company, with headquarters in Indianapolis.

B. S. STEPHENSON

E. P. BLANCHARD

G. P. TORRENCE

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GEORGE E. DIX, president, Steel Union Co., New York, and American representative of the United Steel Works Corpn. of Germany, has returned from a trip to Germany. He found no improvement in sight in Germany's steel industry.

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PAUL MACKALL, vice-president in charge of sales, Bethlehem Steel Corpn., has sailed on a Mediterranean cruise.

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C. F. STANLEY, heretofore assistant secretary, has been made a vice-president of the Fafnir Bearing Co., New Britain, Conn.

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WILLIAM K. GLEN, for a number of years advertising manager of the Crane Co., has been appointed district superintendent, Chicago branch, with offices at 156 North Jefferson Street. He is succeeded as advertising manager by his assistant, HARRY DELANDER.

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FRANK R. WHEELER has been appointed special sales representative, with headquarters at Chicago, by the Worthington Pump & Machinery Corpn. He will cover the Midwest territory, including Chicago, St. Paul, Kansas City, St. Louis and Detroit.

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THOMAS DREVER, formerly secretary-treasurer of the American Steel Foundries, Chicago, has been elected vice-president.

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C. L. WASMER, Cleveland, has resigned as chairman of the board of the United Screw & Bolt Corpn., Chicago, and has become president of the Wasmer Bolt & Nut Co., Cleveland, succeeding JOHN C. WASMER, who has become vice-president and treasurer. C. L. Wasmer was president of the Cleveland Wrought Products Co., previous to its merger with the present United Screw & Bolt Corpn.

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G. H. DOHERTY, purchasing agent of the U S L Battery Corpn., Niagara Falls, N. Y., has been elected president of the Buffalo Purchasing Agents' Association.

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FLOYD O. TANNER, assistant manufacturing manager of the Chevrolet Motor Co. in charge of its Flint, Saginaw and Bay City, Mich., operations, has been appointed general factory manager of the Oakland Motor Car Co., Pontiac, Mich., effective April 1. He will be succeeded by ARNOLD LENZ, heretofore manager of the Chevrolet gray iron foundry at Saginaw. Mr. Lenz and HUGH DEAN, in charge of Chevrolet's Detroit and Toledo plants, will be under the direction of CHARLES E. WETHERALD, general manufacturing manager, with headquarters at Flint. JAMES MILLER, foundry superintendent at Saginaw, will take Mr. Lenz's place as manager. P. H. MCGREGOR, Chevrolet plant manager at Flint, will be general superintendent of the Oakland company. WILLIAM NOTMAN, general superintendent of the motor division of Chevrolet at Flint, succeeds Mr. McGregor. WILLIAM SCOTT, night superintendent of the Flint motor plant, has been appointed general superintendent.

New York Central Obtains Loan of $4,399,000

WASHINGTON, March 29.—To apply to the cost of completing the West Side improvement in New York City, the New York Central has been granted a loan of $4,399,000 by the Reconstruction Finance Corporation. Approval of the loan by the Interstate Commerce Commission was announced last Thursday. Of the total, $800,000 was asked for immediately as the initial installment. Other advances are: One month after initial installment, $100,000; two months, $100,000; three months, $400,000; four months, $399,000. Then follow monthly installments of $200,000 each for 13 months, totaling $2,600,000. Of the total, $4,084,000 is to be spent for general construction at and south of the Thirtieth Street yard and $280,000 is to be spent on completion of work at Sixtieth Street, including bulkhead and track work. Excavation at Forty-fourth Street on land sold by contract to the New York Times Co. will cost $35,000.

The report of the commission said the New York Central stated it could not finance the expenditures through the sale of bonds except upon a basis which in effect would be prohibitive and that the necessary funds could not be obtained upon reasonable terms from other sources.

"Bankers are represented as being averse to making loans the proceeds of which are to be used solely for capital expenditure, and, according to the applicant's statement, the present policy of the banks is to use their cash resources for the relief of urgent and immediate requirements of industry and business," said the report.

Armco Officers Expect a Slow Improvement

George M. Verity, chairman, and Charles R. Hook, president, American Rolling Mill Co., Middletown, Ohio, presenting the company's annual report to stockholders, took a hopeful view of the future. Their letter to stockholders says in part:

"Once begun, improvement can come rapidly, as it has done many times in the past; however, the preponderance of opinion is to the effect that improvement will come slowly throughout the current year and possibly reach some new normal in 1933. After our recent experiences, we can be happy and prosperous with considerably less than a normal volume of business.

"The trend of events in world affairs which has influenced the general business situation during the past year proves conclusively how difficult it is for the world's best minds in finance, industry and economics to see very many months ahead. Two years ago, following the stock market crash, it was the general opinion that market values, outside the field of investment securities, were sound and justifiable. The facts as now recorded show that both commodity and real estate values have been most drastically liquidated.

"We must remember that in spite of all of the 'liquidation of market values' that has taken place, production and earning capacity have not been diminished. We have all of the plants and properties, all of the human initiative, skill and resourcefulness that we had two years ago. We are simply in a period of enforced inactivity. Neither mines, factories nor gold dollars are of value except in proportion as they are kept active. Circulation is a law of life."

J. D. Cunningham Heads Chicago Metal Trades

Labor disturbances were reported at a minimum at the thirty-fourth annual meeting of the Chicago Branch, National Metal Trades Association, held March 24 at the Palmer House. Dr. Gus W. Dyer, professor of political economy, Vanderbilt University, was the principal speaker.

The following officers were elected: President, J. D. Cunningham, president, Republic Flow Meters Co.; vice-president, A. E. Blackwood, president, Sullivan Machinery Co.; treasurer, C. A. Ziebarth, secretary, Bell & Howell Co.

The new executive committee consists of the president, the vice-president, the treasurer, and Charles E. Finkl, general manager, A. Finkl & Sons Co.; W. G. Jones, president, W. A. Jones Foundry & Machine Co.; M. W. McArdle, president, Chicago Flexible Shaft Co.; Ralph H. Norton, president, Acme Steel Co.; C. H. Strawbridge, president, Goodman Mfg. Co., and Charles D. McDonald, vice-president, McDonald Machine Co.

Lackawanna Road Starts Spring Work

The Delaware, Lackawanna & Western Railroad is making purchases for its spring improvement program, according to a statement issued by J. M. Davis, President. The road has ordered 3000 tons of rails from the Bethelehem Steel Co. and has recently taken deliveries of 4500 tons which are now being laid. Lackawanna has also asked for bids on about 1500 solid steel wheels. Ten heavy locomotives are being built for the road at the American Locomotive Co.'s Schenectady plant, and the railroad's own shops at Scranton, Pa., are rebuilding six Pacific type locomotives into heavy switching locomotives.

Trade Commission Reports on Basing

WASHINGTON, March 29. — The habitual practice of cross hauling of a standardized commodity like cement appears to be due primarily to . . . rather rigid maintenance of mill prices at a relatively high level and only secondarily to "tonnage hunger," as often alleged, says a report made by the Federal Trade Commission to Congress which is part of an inquiry into the methods of basing prices with respect to location. The commission stated that the purpose is to give help toward a solution of the problem of a greater economy in distribution. The report is "The Basing-Point Formula and Cement Prices."

It is declared that the high level of mill prices makes the cross-haul possible without absolute loss in total sales and that the rigidity of prices tends to prevent the expansion of sales in maximum net territory by mill price reduction. The basing-point formula of selling is declared to assist in maintaining this rigidity of price at mill in that it prevents a mill in one market area from dumping its product into another market area at prices below the formula delivered prices of the latter without first reducing its own mill price.

The commission points out that the Pittsburgh plus arrangement in quoting prices of steel is an illustration of the basing-point method and that after an investigation the commission issued a cease and desist order.

In a country-wide survey of the price basing methods used by manufacturers, the commission said it found that of the more than 3500 reporting firms, including manufacturers in practically all industries, 44 per cent sell on an exclusively shipping point price basis, 18 per cent on an exclusively delivered price basis and 38 per cent on both bases.

Iron and steel, exclusive of machinery, was said to lead among the 15 per cent of the firms reporting shipping point prices which make all or a part of these prices with partial freight allowances. Such allowances, it is stated, are usually for the purpose of equalizing freight with the competitor "freightwise nearest the buyer's destination." The iron and steel group is said to have shown the highest percentage of firms with delivered prices made on a basing point.

In a detailed discussion on cross hauling, the report says that it is generally recognized by the cement industry itself as an economic evil. The clear implication from the report is that the cross haul develops from use of the basing point system.

Orders for electric hoists in February included 143 units, against 82 in January, according to reports received by the Bureau of the Census from 13 manufacturers.

Continental Steel Prices Go Lower in Keen Competition

French, Belgian and Luxemburg Mills in Contest for Export Business—Soviet Places 200,000 Tons in Germany

LONDON, ENGLAND, March 29 (*By Cable*).—The advisory committee on tariffs will announce its first decisions on further steel tariffs in April.

Markets have been under the influence of holidays which extended through Monday.

There is a slight revival of interest in the Far East and in South American countries in Continental steel, but business is difficult to close. Competition between French, Belgium and Luxemburg mills is extremely keen and has further depreciated Continental prices.

Continental Wire Rod Cartel has fixed its second quarter quota at 275,000 tons.

International Tube Cartel has decided to extend its operations until 1935, but members are permitted to renounce it after one year. It is believed that the principal English and American makers have agreed to this arrangement.

The Soviet Government has placed the following orders with German mills: 60,000 tons semi-finished and sections, 120,000 tons of bars and 120,000 tons of plates, all for April, May and June delivery. A second order of 200,000 tons may be placed for July-August.

Stockholm has placed an order for a bridge to cost 5,000,000 kroner with Swedish and German builders. Turkey and Soviet placed locomotive orders aggregating 20,000,000 marks with the Linke-Hofmann-Busch Works, Breslau.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9	0s.		
Billets, open-hearth	5	7½	to £5	12½s.
Black sheets, Japanese specifications	9	12	6d to 9	15
Tin Plate, per base box	0	15	6 to 16	0
Steel bars, open-hearth	7	17½	to 8	7½
Beams, open-hearth	7	7½	to 7	17½
Channels, open-hearth	7	12½	to 8	2½
Angles, open-hearth	7	7½	to 7	17½
Black sheets, No. 24 gage	8	0	to 8	10
Galvanized sheets, No. 24 gage	9	10		

Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £ at $4.86

Billets, Thomas	£2	4s.
Wire rods, No. 5 B.W.G.	5	5
Black sheets, No. 31 gage, Japanese	11	5
Steel bars, merchant	2	7
Beams, Thomas	2	5 6d
Angles, Thomas, 4-in. and larger	2	6
Angles, small	2	8
Hoops and strip steel over 6-in. base	3	7 6d
Wire, plain, No. 8	5	7½
Wire, barbed, 4-pt., No. 10 B.W.G.	8	15

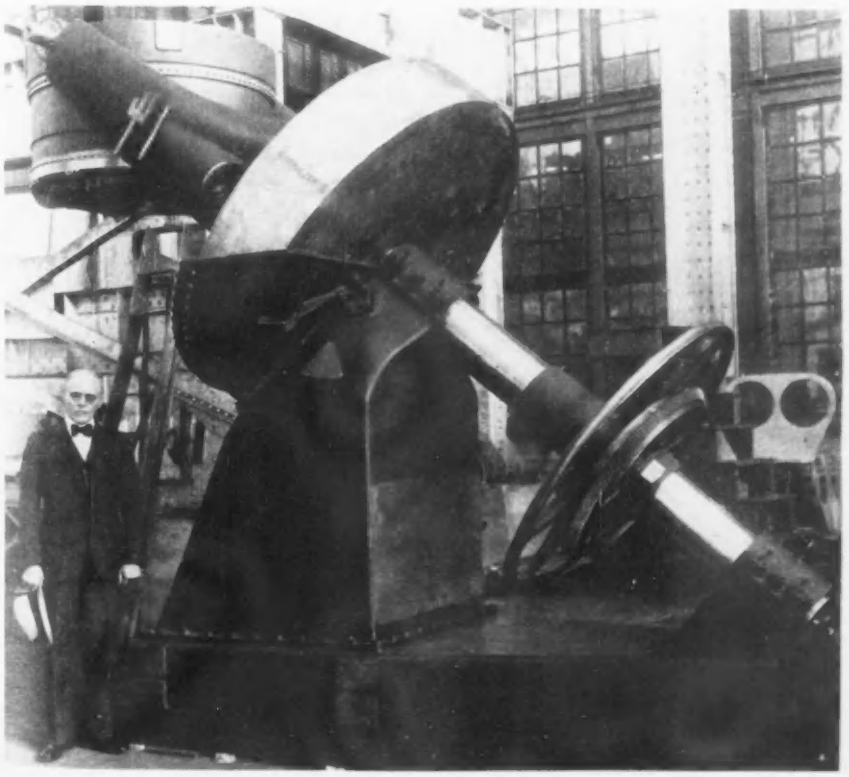
Fabricated Steel Orders Gained in February

WASHINGTON, March 29.—Making a gain of 12,111 tons, reported bookings of fabricated structural steel in February were 57,016 tons, against 44,905 tons in January, according to the Bureau of the Census. Computed bookings in February were 62,400 tons, an increase of 14,000 tons over January.

Orders for malleable castings reported for February were 19,607 tons, against 22,036 tons in January.

Baldwin-Southwark Builds Big Telescope Mounting

AN unusual contract for precision machine work has just been completed in the shops of the Baldwin-Southwark Corporation. This consists of the mounting for the 40-inch Ritchey-Chretien reflecting photographic telescope, the largest of this type yet built, under construction for the United States Navy.



The manufacture of this telescope mounting was unusual. It was quite essential that the various castings be sound, of uniform thickness, within exceedingly close limits as to calculated weights and rigidly true to form.

The accuracy attained in the manufacture of this telescope mounting may well be illustrated by certain final measurements which were made when the assembly was completed. Repeated measurements indicated that the eccentricity of this polar axis did not exceed a quarter of one ten-thousandths of an inch. The angle of the polar axis with the finished face of the base casting was accurate to specifications within less than ten seconds of arc—the limit of sensitivity of the measuring device, the allowed tolerance being thirty seconds of arc.

There is a large worm wheel mounted on the polar axis, which is used for turning the axis to compensate for the earth's motion when observations are actually being made. A high degree of accuracy was necessary in the bearings of this worm wheel and a running fit was secured with no play that could be detected, although there was by actual measurement a clearance of one-one-thousandth inch on each side.

The alinement of such parts as the shell tube, mirror support plate and trunnion ring had to be completed with an accuracy so great that the motion of the telescope during operation would not cause a movement of the image.

• • EDITORIAL

Our Tariffs Disturbed by Fluctuating Exchange

ECONOMIC isolation, the term that political economists have applied to the growing world-wide tendency of nations to bar or restrict the sale of foreign goods by tariffs or import quotas, may have started with our own tariff act of 1930, as Canada and some other nations have charged, but whether this is true or not, it is certain that every new barrier raises fresh problems in international trade.

England raises her steel tariffs, and Continental steel reaches out for new markets. One result is to be seen in the United States, where there is a fresh wave of foreign competition in steel and pig iron, which is not so serious in quantity as in prices. This price competition, most in evidence at Atlantic and Pacific Coast and Gulf ports, has recently become intensified by the offerings from countries whose currencies are depreciated.

A legislative remedy has been proposed, the Hawley bill, designed to equalize prices through an additional tariff levy on goods sold here by countries that are off the gold standard. The steel industry and many other of the country's leading manufacturing groups are organizing to support this bill, on which public hearings will soon be held by the Ways and Means Committee of the House of Representatives.

This bill should not be confused with the efforts that have been made in the House of Representatives to raise duties in the guise of tax levies. The Hawley measure does not propose any actual increase in tariffs, but merely would restore the condition existing at the time the bill was passed, when foreign currencies were on a stabilized basis.

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Mr. Taylor Looks Into the Future

RESPONSIBILITY begets conservatism and it is, therefore, not surprising that the head of the world's largest steel company should choose a time of general economic distress and equally widespread perplexity to sound a warning against untried experiments. In his Boston address, abstracted elsewhere, Myron C. Taylor made a masterful defense of the status quo, pointing out the dangers of disturbing long standing usages and relationships in a highly interdependent society. The following statement sums up his position: "We cannot rebuild the economic world overnight, and if we could do so, it is open to very grave question that we would make a better job of it."

His discussion covered three main topics: the economic unsoundness of artificial measures for price control, the need for tariff protection and the evil of excessive taxation. Impressive and thought-provoking as his reasoning was, one could have wished that it might have been carried further. For example, he stated that unbalanced production and uneconomic competition will be corrected automatically through the sacrifice of business volume for price stability. Yet faith in such an automatic adjustment is difficult to reconcile with the vain appeals of trade associations for voluntary restriction of production.

Mr. Taylor properly emphasized the risk of tearing down a tariff structure which has raised American values above world levels, but he gave an incomplete picture of our export trade when he said that it represented only 10 per cent of our total production. It is true that exports, considered as a whole, are small, but in the case of a number of important commodities, foreign shipments account for a large percentage of American output—approximately 20 per cent for wheat, 50 per cent for cotton and 35 per cent for copper. Retaliatory tariffs that would seriously restrict exports of these and similar products would operate powerfully for a modification of duties on American imports.

Mr. Taylor's forecast of a reallocation of population raises an interesting question. If, as he contends, our cities are overcrowded and large numbers of people must forsake urban life for the farm, where will the increased agricultural output be marketed? Our present farm surplus is too great.

Possibly redistribution of population will take place in an entirely different manner, i.e., through absorption in new industries. Mr. Taylor himself briefly touches on industrial diversification as an ultimate goal, stating that rationalization of production and redistribution of population will create "a growing demand for products old and new and with it a demand for workers."

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THE Interstate Commerce Commission, in approving a loan of $4,399,000 to the New York Central Railroad for completing New York City improvements, stated that "bankers are represented as being averse to making loans the proceeds of which are to be used solely for capital expenditure." The commission quoted the New York Central as stating in its loan application that "the present policy of the banks is to use their cash resources for the relief of urgent and immediate requirements of industry and business." What this actually means is that the banks are withholding loans for the one enterprise that affords the most hope for lifting the depression, namely, necessary and justifiable capital improvements. Possibly there is more money to be made by "rescuing" industrial companies and realty after they go into receivership.

COMMENT • •

Automotive Giants Challenge Depression

ON Saturday, Feb. 27, almost five weeks ago, Henry Ford made his widely heralded announcement that Ford automobile production would soon be stepped up to [illegible] or 6000 cars a day, that 1,500,000 would be built this year, that he would soon spend $47,000,000 for steel and correspondingly large amounts for other materials.

While the delay in the appearance of the new Ford models and the placing of Ford orders for materials have been disappointing, there is reason to believe that a considerable backlog of orders has been building, "sight unseen," on the new models. Eventually, this must be interpreted in terms of increased industrial activity.

In the meantime, General Motors Corpn. announces the launching of "perhaps the most gigantic program ever attempted by an industrial enterprise to stimulate business." This refers to simultaneous national exhibits of its products in 55 cities, beginning April 2.

Industry and the public must wish both of these automotive giants well in their endeavors to stimulate business. Certainly positive action beats watchful waiting for the "turn."

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The Anti-Injunction Bill

THE American Federation of Labor scored a victory last Wednesday when President Hoover signed the Norris-La-Guardia anti-injunction bill. The measure is looked upon by the Federation, and the United Mine Workers of America, as another "magna charta" for labor.

Attorney General Mitchell in a statement to the President recommended that the bill be signed, but pointed out that there is a difference of opinion as to the unconstitutionality of some of its provisions. These, the attorney general said, will have to be determined by the judiciary.

The attorney general does not think "Congress could have intended to protect racketeering and extortion under the guise of 'labor organization activity.' The Department of Justice's anti-trust division has concluded that the measure does not prevent injunctions in such cases and that it "does not prevent the maintenance by the United States of suits to enjoin unlawful conspiracies or combinations under the anti-trust laws to outlaw legitimate articles of interstate commerce." Nor, in the opinion of Mr. Mitchell, does the measure purport to permit interference by violence with workmen who wish to maintain their employment, "and, fairly construed, it does not protect such interference by threats of violence or that sort of intimidation which creates fear of violence."

It may be accepted as a fact that organized labor has succeeded in taking some of the teeth out of the injunctive power. But it may be accepted as being equally true that it does not mean a breakdown of organized law. If the law should give undue privileges to organized labor it will sooner or later have to be amended.

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Research, a Protector of Assets

IN discussing his organization recently, the head of a large automobile manufacturing company remarked, "of course we are proud of our physical equipment. However, any company with several million dollars at its disposal can erect a modern plant which will be the last word in production efficiency. The thing of which we are proudest is our engineering and research staff. That took years to build; the gathering of the best scientific minds obtainable and their concentration on the working out of our problems could not be accomplished overnight in the same manner as the erection of a plant on a rush contract in a few weeks or months."

The depression has brought home to industry as never before the necessity of constantly developing new products and improving old products. Companies which have offered the public something new have discovered that idle dollars can be enticed into circulation. Inquiry has shown that these companies have been able to attain their present enviable standing by devoting much time and money consistently over a period of years to research; otherwise they would not have been prepared with new products for today's crucial test. One need not go further than to the modern refrigerator for proof.

Many of the companies that have ridden through the muck of the depression without being splashed with the red ink of financial deficits can thank intelligently conducted research for their enviable position. He who is satisfied with today's performance and would use it as the measuring stick for the future will awaken tomorrow to find himself outstripped by his competitor.

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IT is almost unthinkable that we should do anything to hinder the progress in labor-saving production machinery. We must go on designing and building more and more efficient tools even if the German philosopher Spengler does tell us our industrial era is now on the toboggan. As long as we have competition, a better method of making a thing will win out over the poorer method. The same number of workers, working the same length of time, with better and better equipment, will produce more and more goods. If we cannot consume this greater quantity ourselves, and cannot export it, it looks as if we might eventually have to shorten the working hours. But first we should thoroughly probe the unexplored corners of our own markets.

Myron C. Taylor Elected Chairman of the Board of United States Steel Corpn.

COMPARATIVELY unknown in the iron and steel industry four years ago when he was made chairman of the finance committee of the United States Steel Corpn., Myron C. Taylor has now been elected chairman of the board, thereby assuming the two-fold position formerly held by the late Elbert H. Gary. The official announcement of the election included the following statement:

At the regular monthly meeting of the directors of the United States Steel Corpn. today (March 29), J. P. Morgan asked the board to agree to his retirement from the chairmanship, which he had assumed at the request of the board as an interim measure following the death of the late Judge Gary.

Mr. Taylor's election did not come as a surprise. He has been recognized as the de facto head of the Steel Corporation for some time. And he has come to be widely known by his deeds rather than his words. Unlike his predecessor, Judge Gary, he is reserved in temperament and averse to interviews. While his public pronouncements have been few, they have been uniformly of high quality, reflecting broad vision and considered judgment. He has a faculty for penetrating analysis and clarity of thought. He has the rare ability of broadly grasping the essentials of a many-sided problem and correctly interpreting their significance. He has shown equal capacity as financier, executive and arbiter of policies. He has a record of accomplishment that will be even more evident in its results in the future than it has been to date.

Mr. Taylor's outstanding achievement as chairman of the finance committee was the retirement in 1929 of the Steel Corporation's bonded indebtedness. Less widely heralded but no less important were the measures he took to round out the corporation's properties, modernize its plants and strengthen its personnel.

Companies purchased included the Atlas-Portland Cement Co., New York, the Oil Well Supply Co., Pittsburgh, and the Columbia Steel Corpn., San Francisco, the latter acquisition making the Steel Corporation literally national in scope so far as the distribution of its plants is concerned. In the field of plant construction and modernization the corporation was conspicuous in both 1930 and 1931, at once contributing to employment and business and showing faith in a greater and more profitable future for steel with the passing of the depression.

With relation to labor the Steel Corporation showed an enlightened attitude, but one based on realities rather than theories. Early in the depression it rotated employment to give a maximum number of employees work. Its policy was epitomized by Mr. Taylor before the American Iron and Steel Institute in October, 1930, when he said: "Let it be said of the steel industry that none of its men was forced to call upon the public for help." Reduction of wage rates was deferred until Oct. 1, 1931, when a cut of 10 per cent was put into effect.

To strengthen Corporation personnel new pension rules were put into effect on May 1, 1931, under which all male employees, including officers, are retired at the age of 70, while female employees are retired at the age of 60.

Mr. Taylor's membership in the finance committee of the Steel Corporation dates back to September, 1925. Hence he was by no means a stranger to the steel industry when he was made chairman of the committee in December, 1927. He brought to the Steel Corporation wide experience as an attorney and corporation executive.

Born in Lyons, Wayne County, N. Y., Jan. 18, 1874, Mr. Taylor is a direct descendant of John Taylor, Puritan colonist, who settled in Massachusetts in 1660, and of Capt. John Underhill, one of the earliest military leaders of the American colonies, who was a native of Stratford-on-Avon, England. Captain Underhill came first to Massachusetts and later settled in Locust Valley, Long Island, on the estate which is now the country home of Mr. Taylor.

Graduating from Cornell University in 1894 as bachelor of laws, Mr. Taylor was admitted in the next year to the New York bar. He soon became interested in the textile business, his first organizations some twenty or twenty-five years ago including the Bay State Mills located at Lowell and Newburyport, Mass. Later he organized the Boston Yarn Co., a textile-selling unit, and through various consolidations became a factor in other important cotton textile enterprises. In 1914 Mr. Taylor and his immediate associates built or acquired control of the Passaic Cotton Mills at Passaic, N. J., the Peabody Mills at Newburyport, Mass., the Rotch Mills, the New Bedford Spinning Co. and the Penrod Mills at New Bedford, Mass., and the Sanford Spinning Mills at Fall River, Mass. These mills represented one of the largest groups in the country engaged in the manufacture of cotton fabrics. In recent years Mr. Taylor has withdrawn his active interest from these organizations, and has given his attention to other corporate affairs, in addition to his connection with the Steel Corporation, being president, Myron Taylor & Co., Inc.; director of the First National Bank of New York, the First Security Co., the New York Central Railroad Co., the West Shore Railroad Co., the American Telephone & Telegraph Co., the Metropolitan Opera & Real Estate Co. and the Lehigh & Wilkes-Barre Corpn.; director and member of the executive committee of the Atchison, Topeka & Santa Fe Railway Co.; and trustee and member of the finance committee of the Mutual Life Insurance Co. of New York.

He is a member of the Society of Colonial Wars, Sons of the American Revoluton, and St. Nicholas Society, and is trustee of the Association for Improving the Condition of the Poor. He has memberships in a number of clubs and is a Quaker.

General Motors Merges Buick and Olds Activities

General Motors Corpn. has announced that the manufacturing activities of the Buick Motor Co., Flint, Mich., and the Olds Motor Works, Lansing, Mich., have been consolidater under the direction of I. J. Reuter, who will assume the title of general manager. Production forces of the Oakland Motor Car Co., Pontiac, Mich., will be coordinated with those of the Chevrolet Motor Co., Detroit, under W. S. Knudsen.

Sales of Buick, Oldsmobile and Pontiac cars will be consolidated under Mr. Reuter, with R. H. Grant as vice-president in charge of sales. Mr. Reuter has recently been general manager of the Oakland company and previously was head of the Olds division. Mr. Knudsen has been president and general manager of the Chevrolet company since 1924.

Hollow Electrode Furnace Reduces Ores to Steel

Direct reduction of iron and other ores in a new type of electric furnace in the production of high-grade steels has recently been accomplished. The furnace is known as the Wiles hollow electrode furnace, invented by Sidney T. Wiles of Buffalo. The patents and furnace are owned by the Buffalo Furnace Corpn., also located at Buffalo.

Briefly, the ores are mixed in a finely divided condition with suitable reducing agents and are passed through the hollow electrode while the current is on, the reduction taking place as the material passes through the electrode. Many heats of both plain carbon and alloy steel have been made, according to an article describing the furnace and the process in some detail, written by T. Holland Nelson, consulting metallurgist, Philadelphia, which will be published in THE IRON AGE in the near future.

SUMMARY OF THE WEEK'S BUSINESS

Steel Ingot Output Again Declines; Tension Relieved by Ford Showing

Industry's Hope for April Revival Strengthened by Prospect of Renewed Activity in Motor Cars—Steel Price Composite Higher

IN the face of a further decline in steel ingot production, the industry has not lost hope for a revival of demand in April. This expectation is strengthened by the announcement of a public showing of the new Ford automobiles on Thursday, the appearance of the new Plymouth car on Saturday and the inauguration on the same day of a country-wide sales drive by General Motors. The test of retail demand for motor cars will come in the next week, and, if even moderately successful, will have an almost immediate reflection on automobile manufacturing schedules and on steel mill operations.

Ingot output has declined this week to about 22 per cent of the country's capacity against 25 per cent last week. There has been a sharp falling off at Cleveland, where one plant has shut down all of its open-hearth furnaces, and lesser decreases have occurred in the Valleys and at Pittsburgh and Chicago. One of the medium-sized independent companies whose principal product is sheets is operating at about 39 per cent, but some of the larger companies, with more widely diversified capacity, are at 20 to 22 per cent.

NOTWITHSTANDING that the steel-making rate has not been so low during the entire depression except for a brief period last December, the steel industry believes that this is the "zero hour" and that new business, principally from the automobile industry but to some extent from other sources, will lift operations appreciably during the next fortnight.

Large orders from the Ford Motor Co., which have been looked for during the five weeks that have elapsed since the much-heralded Ford announcement of its new models, are expected momentarily. Some small orders have been placed, and makers of parts for Ford cars have issued releases of minor amounts. Volume production of Ford cars is now expected to begin the week of April 18, in which case some of the steel that requires two or three weeks for processing must be ordered almost at once. It is believed that the public showing of Ford cars was hastened by the campaign that General Motors has announced. The Chrysler and Chevrolet companies have placed second quarter steel contracts at reported increases in prices.

THE probability that the Federal budget will be balanced by some kind of a tax bill, the ironing out of difficulties with respect to financing of the railroads through the Reconstruction Finance Corporation and renewed automobile trade activity have somewhat relieved the tension that has existed in the steel industry during the past two weeks.

There are frequent reports of prospective increases in expenditures by the railroads. Releases of track supplies are slowly growing, though rail orders are still insignificant.

Building work has broadened in that more private projects are coming out, though public work still predominates. However, financing difficulties and unseasonable weather in some sections of the country are delaying factors in spring construction. Computed bookings of fabricated structural steel in February, as compiled by the Department of Commerce, showed a gain of 14,000 tons over February.

Line pipe tonnage is beginning to appear, a California project requiring 10,000 tons of 12¾-in. pipe being at the closing point, while other pending business, involving larger amounts, may soon be in the market if financing is arranged.

Tin plate is the only finished steel product to show any advance in rollings, the average for the country now being almost 45 per cent of capacity against 40 per cent last week.

Upward of 60,000 tons of plates will be required for linings for tunnels to divert water during the construction of the Hoover Dam. Purchase probably will not be made until summer. This project raises the total of plate work now pending on the Pacific Coast to more than 100,000 tons.

THE steel industry is highly encouraged by the success thus far of its price stabilization movement. Notwithstanding that many buyers remain skeptical as to the final outcome, the steel companies are firmly quoting the new levels on second quarter business, and have taken a fair number of small orders in the past week at advances. During this period, however, some low-priced business against outstanding obligations has also been put on the mill books. With this business out of the way, the stage is set for the real test of the new prices.

With the apparent establishment of 1.60c. a lb., Pittsburgh, on bars, plates and shapes, involving a $2 a ton advance announced about a month ago, THE IRON AGE composite of finished steel rises to 2.087c. a lb. from 2.044c. last week. The low point of the decline was 2.037c., the third week of January.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Mar. 29, 1932	Mar. 22, 1932	Mar. 1, 1932	Mar. 31, 1931
Per Gross Ton:				
No. 2 fdy., Philadelphia	$15.59	$15.59	$15.64	$17.76
No. 2, Valley furnace	15.00	15.00	15.00	16.50
No. 2 Southern, Cin'ti	13.82	13.82	13.82	14.19
No. 2, Birmingham	11.00	11.00	11.00	12.00
No. 2 foundry, Chicago*	16.50	16.50	16.50	17.50
Basic, del'd eastern Pa.	16.00	16.00	16.00	17.25
Basic, Valley furnace	14.50	14.50	14.50	16.50
Valley Bessemer, del'd P'gh.	17.39	17.39	17.39	18.76
Malleable, Chicago*	16.50	16.50	16.50	17.50
Malleable, Valley	15.50	15.50	15.50	17.00
L. S. charcoal, Chicago	23.17	23.17	23.17	25.04
Ferromanganese, seab'd carlots	†75.00	†75.00	†75.00	80.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

†Ferromanganese quotations adjusted to carload unit; larger quantities at discount.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	34.00	34.00	34.00	36.00
Rerolling billets, Pittsburgh	27.00	27.00	27.00	30.00
Sheet bars, Pittsburgh	26.00	26.00	26.00	30.00
Slabs, Pittsburgh	27.00	27.00	27.00	30.00
Forging billets, Pittsburgh	33.00	33.00	33.00	36.00
Wire rods, Pittsburgh	37.00	37.00	37.00	35.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.50	1.50	1.50	1.65

Finished Steel

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.60	1.50	1.50	1.65
Bars, Chicago	1.70	1.70	1.60	1.70
Bars, Cleveland	1.65	1.65	1.65	1.70
Bars, New York	1.95	1.85	1.85	1.98
Tank plates, Pittsburgh	1.60	1.50	1.50	1.65
Tank plates, Chicago	1.70	1.70	1.60	1.70
Tank plates, New York	1.898	1.798	1.798	1.93
Structural shapes, Pittsburgh	1.60	1.50	1.50	1.65
Structural shapes, Chicago	1.70	1.70	1.60	1.70
Structural shapes, New York	1.86775	1.76775	1.76775	1.90½
Cold-finished bars, Pittsburgh	2.00	2.00	2.00	2.10
Hot-rolled strips, Pittsburgh	1.40	1.40	1.40	1.55
Cold-rolled strips, Pittsburgh	2.00	2.00	1.90	2.25

Finished Steel

Per Lb. to Large Buyers:	Mar. 29, 1932 Cents	Mar. 22, 1932 Cents	Mar. 1, 1932 Cents	Mar. 31, 1931 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.20	2.20	2.15	2.25
Hot-rolled annealed sheets, No. 24, Chicago dist. mill	2.30	2.30	2.30	2.35
Sheets, galv., No. 24, P'gh	2.85	2.85	2.75	2.90
Sheets, galv., No. 24, Chicago dist. mill	2.95	2.95	2.85	3.00
Hot-rolled sheets, No. 10, Pittsburgh	1.55	1.55	1.60	....
Hot-rolled sheets, No. 10, Chicago dist. mill	1.65	1.65	1.70	....
Wire nails, Pittsburgh	1.95	1.95	1.95	1.90
Wire nails, Chicago dist. mill	2.00	2.00	2.00	1.95
Plain wire, Pittsburgh	2.20	2.20	2.20	2.20
Plain wire, Chicago dist. mill	2.25	2.25	2.25	2.25
Barbed wire, galv., Pittsburgh	2.60	2.60	2.60	2.55
Barbed wire, galv., Chicago dist. mill	2.65	2.65	2.65	2.60
Tin plate, 100 lb. box, P'gh.	4.75	4.75	4.75	5.00

Old Material

Per Gross Ton:				
Heavy melting steel, P'gh	$10.25	$10.25	$10.25	$12.75
Heavy melting steel, Phila.	7.25	7.25	7.37½	10.50
Heavy melting steel, Ch'go.	7.12½	7.12½	7.12½	10.00
Carwheels, Chicago	7.00	7.00	7.25	9.50
Carwheels, Philadelphia	9.50	9.50	10.50	13.00
No. 1 cast, Pittsburgh	9.50	9.50	9.75	12.50
No. 1 cast, Philadelphia	9.50	10.00	10.00	11.50
No. 1 cast, Ch'go (net ton)	7.00	7.00	7.50	9.50
No. 1 RR. wrot., Phila.	8.50	8.50	8.50	12.00
No. 1 RR. wrot., Ch'go, (net)	5.50	5.50	6.50	8.25

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$2.25	$2.25	$2.25	$2.50
Foundry coke, prompt	3.50	3.50	3.50	3.50

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	6.12½	6.12½	6.12½	10.12½
Electrolytic copper, refinery	5.75	5.75	5.50	9.50
Tin (Straits), New York	21.20	21.75	21.90	26.75
Zinc, East St. Louis	2.77½	2.77½	2.75	3.95
Zinc, New York	3.14½	3.14½	3.12	4.00
Lead, St. Louis	2.90	3.00	3.05	4.25
Lead, New York	3.00	3.15	3.30	4.50
Antimony (Asiatic), N. Y.	6.12½	6.12½	6.37½	7.00

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

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▲▲▲ The Iron Age Composite Prices ▲▲▲

	Finished Steel	Pig Iron	Steel Scrap
March 29, 1932	2.087c. a Lb.	$14.43 a Gross Ton	$8.21 a Gross Ton
One week ago	2.044c.	14.43	8.21
One month ago	2.037c.	14.47	8.25
One year ago	2.128c.	15.71	11.08
	Base on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.	Base on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1932	2.087c., Mar. 29	2.037c., Jan. 19	$14.81, Jan. 5	$14.43, Mar. 22	$8.50, Jan. 12	$8.21, Mar. 22
1931	2.142c., Jan. 13	2.052c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.362c., Jan. 7	2.121c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.412c., April 2	2.362c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.391c., Dec. 11	2.314c., Jan. 3	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.453c., Jan. 4	2.293c., Oct. 25	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22
1926	2.453c., Jan. 5	2.403c., May 18	21.54, Jan. 5	19.46, July 13	17.25, Jan. 5	14.00, June 1
1925	2.560c., Jan. 6	2.396c., Aug. 18	22.50, Jan. 13	18.96, July 7	20.83, Jan. 13	15.08, May 5

Pittsburgh Steel Production Declines; Reviving Demand Expected Soon

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PITTSBURGH, March 29.—Local steel interests have been disturbed by unfavorable sentiment in the last week, and even the end of the quarter has failed to bring any marked improvement in aggregate finished steel releases. On a number of products, tonnage on old contracts which is not specified by the first of the month is scheduled to be canceled, but even this threat on the part of producers has failed to rouse consumers from their lethargic buying habits.

In the face of discouraging current conditions, many producers have not lost their belief that a change for the better is certain to come during April. Sales activity in the automobile industry, together with formal showing of the new Ford car, is calculated to bring improvement from this source, and the increasing volume of inquiry for structural steel and reinforcing bars is regarded hopefully. Tin plate is showing a gradual seasonal gain, and the first of the year's line pipe tonnage is beginning to appear. A definite inquiry on the Pacific Coast calls for 10,000 tons of pipe. Other pending business involves much larger amounts.

The success of recent efforts at price stabilization are also encouraging to steel producers. The general market on bars, plates and shapes is being advanced this week to 1.60c., Pittsburgh, indicating the apparent success of steel companies to hold this price, which was announced about a month ago. The market on sheets and strip steel also reflects increasing strength, and even the automobile companies are reported to be paying the higher figures for material bought recently. The wire market is particularly well maintained, and bolts are stronger. Talk is heard of advances on other products, and further mark-ups on items advanced recently, if the present program can be carried out successfully.

Steel ingot production has again declined, and this week Pittsburgh district open-hearth plants are not engaged at more than 21 per cent of capacity. Valley schedules for the week are also lower, but mid-week improvement may carry production up to nearly 25 per cent. Over the week-end Valley mills had fallen under 20 per cent. Production schedules in the Wheeling district are unchanged.

In the finishing departments only tin plate has shown a gain, and this has been rather limited. Sheet and strip output is still very low, and wire mills are just about holding their own. Output of bars is a shade lower, and the local rail mill is inactive.

Though Pittsburgh district steel ingot production has declined to 21 per cent, an increase in buying is expected to reverse the trend soon.

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Steel producers encouraged by apparent success of price stabilization program. Bars, plates and shapes now quoted at 1.60c.

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Scrap market steady. Larger buying believed to be in the offing.

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The market on raw materials is very quiet, although sizable scrap purchases are again in the offing.

Pig Iron

Shipments of foundry iron during March declined somewhat from those of February, and no interest in second quarter purchases has been manifested. Consumers who usually buy in advance have sufficient iron owing them on old contracts to carry them along for some time. Others are filling their needs in the usual hand-to-mouth way. Prices are receiving little test and are nominal at $14.50, Valley furnace, for basic, $15 for foundry and $15.50 for malleable and Bessemer. The Pittsburgh furnace is quoting foundry, malleable and Bessemer at $16.

Bars, Plates and Shapes

Demand for heavy hot-rolled products is expanding slightly, particularly from the standpoint of inquiries. However, lettings of structural steel and reinforcing bars have not improved very much in this district. Many jobs are held up longer than usual by financial difficulties, and unseasonable weather has delayed some outdoor activity. In the country as a whole, the scope of work has broadened considerably, and many more private enterprises are coming out for bids than was the case a month or two ago. Plates are still very quiet, with the principal lines of consumption dormant. Railroad car building plants are inactive, and barge yards have little or no work. Inquiry for barges continues fairly good, but difficulties in financing are holding up a number of orders. Movement of bars to the automobile industry is very light, but change for the better is expected at any time.

The price structure is gradually being clarified, and producers expect to cancel contracts at low prices which are not fully specified against by March 31. Under the circumstances the market on bars, plates and shapes can again be quoted at 1.60c., Pittsburgh, as compared to a $2 range over the last month.

Semi-Finished Steel

March shipments of semi-finished steel have fallen under those of February, and consumers show no tendency to expand their requirements. No second quarter contracting is reported, and prices on billets, slabs and sheet bars range from $26 to $27, Pittsburgh or Youngstown. Buyers of wire rods are placing their usual quarterly contracts, and the price seems to be well maintained at $37, Pittsburgh.

Rails and Track Supplies

The New York Central has not yet bought rails. The local producer has some rail tonnage scheduled for April rolling, and there is reason to believe that the month will make a better showing than March. Specifications for accessories during March were fairly satisfactory considering the general condition of the carriers, but new buying is very light. Scarcely any business in light rails is coming out.

Bolts, Nuts and Rivets

With the quarter drawing to a close, consumers are being asked to specify against old low-priced contracts, and most of this business will be removed from producers' books by the first of the month. On new orders the present discount on bolts is fairly well maintained, while large rivets are holding at $2.25 a 100 lb.

Cold Finished Steel Bars

A fair percentage of contract buyers has been covered for second quarter at the prevailing price of 2c., Pittsburgh, but releases are very light. Production is still under the 20 per cent level.

Tubular Goods

The market for line pipe is beginning to show a little life, although inquiries are slow to reach the stage where negotiations for purchases can get under way. The Southern Counties Gas Co., Los Angeles, is in the market for 68 miles of 12¾-in. pipe, requiring 10,000 tons of steel. This business is expected to be placed immediately. A projected gas line to run from the Wyoming and Montana fields to the Pacific Northwest is still being considered, but no inquiry for pipe has appeared. The extension to the Northern Natural Gas Co.'s line to run from a point in Illinois to Milwaukee has again been postponed. No change in demand for other types of pipe is reported, and some companies find business worse than it was in February. However, more favorable developments in the oil industry are expected to be reflected in pipe buying in a few months. Drilling operations in the mid-continent fields will probably be stepped up in the near future, which will lead to a better movement of oil well casing and other oil country products.

Wire Products

Most of the contract buyers in this line are now covered for the second quarter, and producers are well satisfied with the strength of the current prices. Scarcely any deviations are reported from $1.95 a keg, Pittsburgh, on nails, and 2.20c., Pittsburgh, on manufacturers' wire. The jobbing trade is showing a little more activity. Prices on single loop bale ties have been raised $5 a ton, and are now quoted at $50 in carloads, $52 for mixed carloads, and $55 for pool carloads. Less carload lots are being quoted at $60 a ton, an advance of $7.

Sheets

Aggregate tonnage the past week has shown no marked change, and the sheet industry is doing well to maintain its recent levels of production. However, low-priced business is being gradually worked off company books, and the beginning of the new quarter will see the general price structure in considerably better condition. New business is generally being taken at the full levels, and buyers are said to be refusing the tonnage offered at lower figures. Scarcely any automobile business is being placed, although spring activity in that industry promises almost certain gains in tonnage during the next month.

Tin Plate

Production has risen slightly, with heavier specifications coming from the larger container manufacturers. The current rate is nearer 45 than 40 per cent, and releases are gaining sufficiently to indicate a gradual stepping up next month.

Strip Steel

The market is still very quiet, and buying by the automobile industry is still lacking. A few small releases are coming through, and Ford has placed orders for a small tonnage of corrosion resisting strips. Prices are holding much better, and business taken for the second quarter is generally at the full quoted schedules on both the hot and cold-rolled material.

Coke and Coal

Domestic coke is still more active than the other grades, but dealers are uwilling to build up stocks because of the nearness of spring. The furnace grade is very dull, and shipments to the foundries are no heavier than they have been.

Old Material

The scrap market has been quiet in the last week, the only sales into consumption reported having been in a few small lots of No. 1 heavy melting steel at $10. While this price is slightly under recent mill purchases of this grade, it is the same figure paid by this consumer the last time it bought and represents no change in the quotable market. Two other users are expected to come into the market in the next week. Dealers are still buying material to cover old orders at $10 and $10.25 and the market shows no marked weakness. Hold-ups are in effect at two points in the district, but no surplus scrap is accumulating. Blast furnace scrap is particularly dull, and no recent sales of turnings are reported. Prices generally are unchanged. The Baltimore & Ohio list, closing April 4, contains 3750 tons.

Birmingham Pig Iron Business Still at Low Ebb, Steel Demands Hold to Recent Average Level

BIRMINGHAM, March 29.—Foundry operations in the South are at low ebb, with most schedules uncertain from week to week. This explains the continued sluggishness of the pig iron demand. Some weeks buying dries up almost completely. Orders now are generally for a minimum car. March shipments have been a little ahead of those for February, but behind those for January. The total movement during the first quarter was far less than was expected at the beginning of the year. Forward buying has practically disappeared. There has been quite an accumulation of book tonnage, due to failure of the buyers to take up their contracts. Some of this tonnage extends back for more than a year. Quotations remain at $11 for the Southern market. Five furnaces are in blast, four on foundry iron and one on basic iron. No change has been made in recent weeks.

Steel

Finished steel is holding more or less to the level of recent weeks. Some lines sag and others gain slightly from week to week, but the aggregate tonnage shows but little difference. One company reported slight gains in both orders and shipments last week, while another company had about its usual volume. Seasonal demand for wire products has continued longer than was expected. The tornado which swept through Mississippi and Alabama last week with such terrific destruction will make necessary some replacements in sheets and wire products, but such bookings are not expected to be of any consequence at this time. New prices for sheets, plates, bars and structural shapes are firm for second quarter business.

No further announcement has been made about the reopening of the Ensley rail mill of the Tennessee company on April 4, and it begins to look as if this schedule will not be carried out.

Present open-hearth operations comprise six units, the Tennessee company having four active at Fairfield and Gulf States Steel two at Alabama City.

Scrap

The scrap market is at a standstill. Requirements of the steel mills and foundries are extremely low. Buying is confined to an occasional car.

New England Pig Iron Buying Still Very Light

BOSTON, March 29.—Pig iron sales continue light, having totaled less than 1000 tons the past week. They included 100 tons No. 2X to a Turners Falls, Mass., melter by foreign iron interests at a reported price of less than $18 a ton, delivered. Iron is being bought mostly for prompt delivery. A central Massachusetts melter is inquiring for 300 tons of No. 2X, second and third quarter delivery. Here and there foundries are increasing melts, but the industry generally is quite flat.

Old Material

An occasional car of engine blocks is shipped to the Pittsburgh district, but prices there on No. 1 heavy melting steel and other materials are too low to attract business. The freight rate on scrap from Boston to Worcester, Mass., has been dropped from $1.89 a ton to $1.25. As a result, the American Steel & Wire Co. has lowered its offers for bundled skeleton 50c. a ton to $4.50 a ton, delivered, and No. 1 heavy melting steel to $6.50 to $6.75.

Chicago Markets More Hopeful on Eve of Probable Automobile Upturn

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CHICAGO, March 29.—So far as performance is concerned, the local iron and steel market has not been able to hold its own, but the outlook is quite definitely improved. Almost at every turn there are reports that the railroads are actively preparing for larger expenditures, and from all preliminary indications the automobile industry is now released from its bonds of uncertainty.

Many local sellers have had promises of business contingent on Ford's playing his hand. Ford's move, Chrysler's frank announcement and General Motors plans for country-wide shows are expressions of determination that are particularly satisfying to the steel trade. One seller of pig iron ventures the statement that the automobile manufacturers' and parts makers' promises of business should make April shipments the best in over a year. Western railroads continue to call men back to shops, and track improvement programs are under way.

Price structures are still somewhat variable. Though some protection still stands on plates, shapes and bars, there is greater determination to hold quotations at 1.70c. a lb., Chicago. Sheet prices are holding on a few scattered contracts and wire quotations are steady in the face of a contracting volume that is disappointing. Scrap prices, due to limitations of supplies, are leaning to the stronger side and from all indications will move up at the first sign of a substantial gain in demand. Quotations on pig iron remain weak, with carloads occasionally moving at $16 a ton, local furnace.

Ingot output is lower, the average being under 23 per cent of capacity.

Steel operations are still depressed, but the immediate outlook appears to be more hopeful.

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Pig iron shipments also expected to gain next month on strength of automobile program.

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Railroads are believed to be about to expand their purchases.

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Scrap prices firmer and are in position to advance on any increase in the demand.

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Pig Iron

Shipments of Northern foundry iron have failed to make a gain over the February rate, but moves on the part of automobile manufacturers and parts makers, who in many instances have made promises contingent on these moves, lead pig iron producers to take a far more hopeful attitude toward April. Prices continue to waver, with here and there a $16 quotation on a small lot. Buying in tonnage is dull. Southern iron is quiet, but prices are steady at $10 a ton, Birmingham, for delivery to this district. A few carloads of charcoal iron have been placed at $20 a ton, furnace.

Coke

By-product foundry coke is steady at $7.50 a ton, local ovens. Shipments are light, but fairly steady.

Reinforcing Bars

Inquiries and sales are lagging, and dealers are standing by awaiting releases on road contracts placed last year. These shipments are expected to start about April 1. Prices remain nominal except on small lots. Quotations on rail steel bars for road work are weak in southern Illinois, which is a focusing point for competition from several groups of mills. Low bidders are being announced on new road work.

Bolts, Nuts and Rivets

Second quarter contracting is near the end and indications are that the new price level is holding. Specifications remain spotty and small in the aggregate.

Rails and Track Supplies

The Soo Line has ordered 5000 tons of tie plates and other miscellaneous purchases, bringing the total to 7000 tons added to mill books. A railroad operating west from Chicago is closing for 2000 tons of rails. It is of interest that some railroads are buying track supplies and are not coming into the market for rails, it being their intention to maintain trackage with as little expense as possible. Both Chicago rail mills are operating, but output remains light. Track supply departments are experiencing slowly growing releases.

Plates

This commodity is as quiet now as at any time this year. Sellers in search of business report that there is little prospect of finding it in the oil country and the prospects in the railroad equipment field are still obscure, though the railroads are more willing now to discuss the subject than heretofore. Requirements for repair work both in contract shops and in railroad repair departments are light. Men are still being called back to railroad shops, but evidently their work is such that little steel is needed.

Structural Material

As has been characteristic for many months, public work continues to be the backbone of the structural market. An auditorium at St. Louis and bridges in Illinois will take 6000 tons. Bids on the De Pere, Wis., bridge have been thrown out and the job is being readvertised. In Chicago the trade has little to look forward to except new buildings for the World's Fair. Railroad bridge work is confined to small tonnages for minor bridge repairs.

Cold-Rolled Strips

Forward buying has gained no headway. Current specifications are spotty. Output averages close to 18 per cent of capacity.

Cast Iron Pipe

Improvement in demand for cast iron pipe seems to be limited to small lots, on which competition is extremely keen. Tonnages have been placed by Portsmouth and Lancaster, Ohio, and Cedar Grove, Wis. Oshkosh, Wis., is in the market for a few carloads. Chicago's contribution to recent business was orders for special casting for use at several pumping stations.

Bars

Although bars are in relatively better demand than other finished steel commodities, use is lagging and it is difficult to find any consumer that is taking bars in large quantity. The trade is hopeful that Plymouth's an-

nouncement of a showing date and Ford's public showing this week will bring some revival to this market. Forward buying is exceptionally dull. Output of rail steel bars is at 30 per cent of capacity. Rail steel prices range from 1.50c. to 1.60c. a lb.

Wire Products

Forward contracting, though under way, is small in aggregate volume. Specifications are fair, though they are not growing in volume as would be expected at this time of year. Concrete reinforcement mesh is not yet moving in large quantity and there is apprehension among sellers that tax muddles may hold back some paving work that had been planned for this year. Copper wire demand is failing to show its usual spring activity.

Sheets

New buying for the second quarter is more promising, but of greater momentary importance are increased specifications by manufacturers of barrels and containers and from the roofing trade, which is experiencing a moderate gain in spring demand. Distribution by jobbers remains light.

Old Material

Such strength as there is in scrap is due to diminishing available supplies. A sale of heavy melting steel has reaffirmed quotations on this grade, and dealers are finding little profit in the transaction. Although there are no takers of rerolling rails at $10, railroad offerings are bringing as high as $9.40 a gross ton on track. No. 1 railroad cast and brake shoes are up 25c., not so much on consumer demand as on the score of scarcity of these grades. Dealers are paying $4 a gross ton for cast iron borings for delivery to local docks. The whole market appears to be ready to spring upward at the first substantial increase in demand.

Eastern Pennsylvania Markets See Hope in Firmer Steel Prices

Volume of Business Has Not Increased, but Some Orders Have Been Taken at Higher Levels

PHILADELPHIA, March 29.—The lassitude of the market in this district continues, but a note of encouragement is seen in the apparently firmer attitude of mills regarding new price levels. On the whole, they are reported to be adhering to the higher quotations on new business, though occasional price cuts still make their appearance.

Sheet makers in particular seem to be determined to hold to the advanced quotations for the second quarter, and only an infrequent break in prices is reported. While the new prices on sheets and heavy lines, including shapes, bars and plates, are untested, manufacturers reflect more confidence in their maintenance. Buyers, on the other hand, still show doubt as to the ability of holding the new levels, but to a less degree than previously. The general attitude of the buyer is receptive to higher prices provided assurance is given that they will be insisted upon when selling to competing interests.

Steel operations remain unchanged at 15 per cent of capacity.

Pig Iron

The market is extremely dull. Trading is confined to a few car lots.

Plates, Shapes and Bars

Makers are reflecting a firmer stand on the new quotation of 1.70c., though it has not been tested sufficiently to indicate whether it can be held. Buyers are showing no great interest. Their principal concern is that competitors are not given preferential treatment and mills are informing them that they will not be. Unconfirmed reports are in circulation that the railroads are preparing to come into the market about June 1 to place large deferred orders for miscellaneous requirements. It is said that if pending applications for loans are granted the tonnages proposed will be considerably increased. The trade has had so many encouraging reports turn out to be without basis that it has shown interest in the current report rather than placing confidence in it. A mill in this district reports an order for 1200 tons of merchant bars at 1.60c., Pittsburgh. Reinforcing bars are easy at 1.60c., a price which frequently is cut.

Sheets

That sheet makers generally have taken a firmer stand on prices is indicated by the refusal of some mills to accept business at the old levels on extended contracts or new orders. Manufacturers have sent out statements to consumers that the contracts will be rigidly adhered to and report that buyers are showing less price resistance. The want of a test of the new levels leaves the situation with some uncertainty, but makers are showing increased confidence. Some mills are talking of further prospective advances early in the second quarter.

Bolts, Nuts and Rivets

A small amount of business has been done in bolts and nuts at the new quotation of 75 per cent for the second quarter. This quotation succeeds the former quotation of 73, 10 and 10 off. A small amount of contracting has also been done at the new quotation of 2.25c., base, Pittsburgh, on rivets. Price shading has not disappeared.

Imports

Imports last week were: Pig iron from the Netherlands, 86 tons; ferromanganese from France, 500 tons; galvanized steel strips from England, 4 tons.

Old Material

The market continues to be extremely dull. No. 1 cast has softened and is now quoted at $9.50 to $10.

Cincinnati Pig Iron Sales at Low Level

CINCINNATI, March 29.—Pig iron business in March was at a lower level than that of January or February. Weekly totals were under 1000 tons. The past week was typical of the month, scattered carload orders having totaled only 700 tons. No interest in second quarter coverage has developed. In fact, some consumers are carrying over fair inventories from first quarter purchases. Northern prices continue to be uncertain and reports of the waiving of silicon differentials persist. Southern iron is firm in a dull market. An inquiry for 500 tons of foundry iron from an Ohio melter is the only pending business of interest.

Finished Steel

Specifications from sheet users against their first quarter contracts brought a moderate improvement in the district demand the past week. Buyers are anticipating their needs for the next 30 days, but are wary of increasing inventories too much. Production will be increased to near 40 per cent of capacity this week. The price structure continues steady.

Old Material

Sales of scrap are small and at low prices. Lack of increased mill activity has kept shipments at a low level.

Detroit Scrap Steady

DETROIT, March 29.—Scrap sales the past week were meager, with prices steady and unchanged.

Showing of New Ford Cars Aids Sentiment in Cleveland Trade

Business Improves Slightly, Principally in Contract Specifications, but Operations Are Lower

CLEVELAND, March 29.—A better feeling has developed in the steel industry as a result of the formal announcement of the bringing out of the new Ford car. This will relieve the tension that has existed in the motor car industry for some time. As prospective buyers have been holding back until the Ford car came out, the whole industry has been adversely affected. With the removal of this obstacle, the approach of more favorable weather for motor car sales, and intensive selling campaigns that are being conducted, motor car manufacturers will soon be able to gage the extent of the spring market for cars.

The long looked-for purchases by the Ford company of round tonnages of sheets and strip steel are expected to be made without further delay. Cleveland parts makers placed some small orders for steel for Ford parts during the week. A local stamping plant making Ford running boards is awaiting further releases after producing 100,000 boards. Steel business showed some gain the past week. However, there was a sharp reduction in local steel plant operations this week, four open-hearth furnaces having been shut down, leaving only eight in operation, equal to 24 per cent of local ingot capacity, a decline of 11 points. This is the lowest operation since last August. The Otis Steel Co., which has recently operated two furnaces, shut down its open-hearth plant, and the two other producers each took off a furnace.

The slight improvement in the demand for steel has resulted from the placing of specifications against expiring first quarter contracts. Consumers of steel bars, plates and structural material, sheets and hot-rolled strip have in some cases, because of the price advances, issued specifications in excess of immediate needs against expiring first quarter contracts. While the market as a whole has a firm tone, there has been little test of the new second quarter prices. No new railroad inquiry is pending. The Wheeling & Lake Erie has not yet placed its 100 cars.

Pig Iron

The market shows a little improvement in demand for small lots for current needs and for second quarter contracts. New shipping orders, mostly from the motor car industry, including releases from foundries that have taken orders for castings for the Ford Motor Co., indicate some gain in shipments in April over March. The motor car industry has taken less iron this month than in February, but shipments to other consumers, including jobbing foundries, were slightly better this month than during the previous month. The local price is steady at $15.50, furnace, for foundry and malleable grades. For out-of-town shipment there is a considerable range in prices, depending on the point of delivery. However, for nearby shipment $15, furnace, is the usual price.

Coke

The present price of $8.27 for by-product foundry coke has been reaffirmed for April shipment. Demand continues slow.

Bars, Plates and Shapes

Some second quarter contracts for these products have been taken at 1.65c., Cleveland, for bars and at 1.60c., Pittsburgh, for plates and shapes, and some small-lot current orders have been placed at these prices by consumers not having contracts. However, the advances are meeting with considerable resistance, many buyers not yet being convinced that the new prices will hold, particularly on plates and shapes. Should they not be maintained, contracts already taken will be revised. An inquiry is out for 900 tons of structural steel for foundations for the Cleveland Post Office, this work not being a part of the post office structure itself, for which plans have not yet been issued. This is the only new structural inquiry of any size.

Nails and Wire

There is considerable pressure for concessions from $1.95 a keg on nails, but this price appears to be maintained, although sales have been confined to car lots.

Sheets

Demand has been stimulated somewhat by specifications against first quarter contracts at old prices. Most of the producers will accept specifications against these contracts until April 1 and for shipment until May 1. This permits consumers having contracts to secure sheets for several weeks at 2.15c. for hot-rolled annealed and 2.65c. for light cold-rolled. On strictly new business 2.20c. is being maintained for hot-rolled annealed sheets, and the new prices on other grades are also firm. Some of the steel barrel manufacturers report a gain in orders from the oil industry, and this is reflected in a gain in sheet orders from that source. One mill has adopted the new quantity differentials for less than carload lots for galvanized sheets and another for all grades.

Strip Steel

Specifications for hot-rolled strip improved the past week, but largely from consumers who have concessions from the 1.40c. and 1.50c. prices in their contracts which expire March 31. Demand from accessory plants that supply some of the leading motor car manufacturers has experienced no revival from the decline that appeared a few weeks ago. Consumers are showing a hesitancy about contracting for the second quarter, as there has been little test of prices for that delivery. Cold-rolled strip is very dull. For all new business 2c. Cleveland, is being quoted.

Old Material

The market is virtually at a standstill. There is no consumer demand. Dealers are not buying scrap because they have practically no shipping orders either from local mills or from the Valley district.

Buffalo Pig Iron Sales in Single Carloads

BUFFALO, March 29.—Pig iron selling is confined to carload lots. Competition of foreign iron in the East has almost eliminated the local producers.

Steel

The Lackawanna plant of the Bethlehem Steel Co. is operating seven open-hearths. Republic Steel operated four open-hearths until Monday. These will probably resume later in the week. Wickwire Spencer continues to operate two. Other mill operations are unchanged.

Structural steel fabricators are figuring 400 tons for a high school at Albion, N. Y. A grade crossing elimination at Elmira will require 100 tons. This job is for the Lackawanna road and will probably require 500 tons of reinforcing bars. Bids are due April 4.

Old Material

A local mill is acceptig delivery of borings and turnings and some of the Frontier consumers are accepting this grade. Stove plate is scarce.

About 35,000 men will be employed on State and county roads in Illinois during the 1932 construction season, according to H. H. Cleaveland, director of the State Department of Public Works and Buildings. This program, he said, calls for approximately 1000 miles of paving and related work. The funds apportioned for the actual road construction planned total $40,000,000.

New York Steel Trade Seeking Contract Specifications

Buyers Not Very Responsive to Efforts of Mills to Secure Orders Against Low-Priced Obligations

NEW YORK, March 29.—Steel salesmen are spending most of their time this week in soliciting specifications against expiring first quarter contracts. Their efforts have been only moderately successful. If the steel companies were permitting buyers to specify against these contracts for delivery at any time during the second quarter, the result might be slightly different, but all steel specified by March 31 must be accepted by the buyer some time during April. As requirements for the next month are bound to be rather light, the specifications are correspondingly small. Neither consumers nor jobbers are willing to put much steel in stock even if there is a sure chance of saving $2 a ton or more. Another factor is that buyers do not seem convinced that the advanced prices will hold. However, the steel companies seem determined to maintain them, and a sidelight on this situation is the intimation in some quarters that bank pressure has been brought to bear on certain steel companies because of the steady losses they have been suffering, which, it is feared, may go so far as to affect payment of interest on bonds.

In the cleaning up of first quarter obligations, some low prices have been made. For example, upward of 100 tons of plates has been taken by an Eastern mill at about 1.50c., mill, which is $2 a ton below the nominal price for first quarter and $4 below the announced price for second quarter.

There has been no noticeable improvement in business; in fact, some companies report that sales in the past week were below the average of the first three weeks of the month.

An oil company with headquarters in New York has inquired for about 75,000 boxes of tin plate in oil can sizes for export.

Pig Iron

The light volume of business that continues from week to week indicates that consumers are still adhering rigidly to a hand-to-mouth buying policy. With few exceptions, orders from both large and small users specify only car lots. For the fourth consecutive week, total sales amounted to about 2500 tons. The New York Central Railroad is inquiring for a small tonnage of No. 2 plain iron for early shipment. Despite the dearth of prospective business and the competition on lower-priced foreign brands, domestic sellers are reflecting a firmer attitude on prices. Buffalo iron is held firmly at $14.50 to $15, furnace. Eastern Pennsylvania iron is quotable at the same range, with the higher side quoted on most business.

Reinforcing Bars

With new building projects generally requiring only limited quantities of bars, actual test of the advanced base of 1.60c., Pittsburgh, or 1.95c., New York, has thus far been precluded. An indication as to the strength of the new quotation may be soon forthcoming, however, when prices are submitted on several jobs which will require from 100 to 200 tons. The Gibson Art Co. building in Long Island City will take about 200 tons, an extension to Sofia Brothers, Inc., warehouse in New York will require 142 tons and an industrial garage in Long Island City specifies 100 tons.

Old Material

A sizable tonnage of No. 1 heavy melting steel has been sold by Schiavone-Bonomo Corpn. for prompt shipment out of New York to Japan. The improved demand from the Far East is further reflected in an inquiry from China for 1250 tons of wire and plate scrap. A recent purchase by Bethlehem Steel Co. of No. 2 heavy melting steel has established the price of that grade at $4 a ton.

Pacific Coast Pending Plate Business Totals Over 100,000 Tons; Hoover Dam to Take 60,000

SAN FRANCISCO, March 28.—Federal engineers and the Six Companies, Inc., contractor for Hoover Dam, have made preliminary announcement that 60,000 to 70,000 tons of plates will be required to line the tunnels for diverting the water of the river during actual construction of the dam.

Tunneling operations are well along and the plate tonnage will probably be contracted for during the coming summer. This inquiry raises the total pending plate tonnage on the Pacific Coast to over 100,000 tons, including such major projects as 2000 tons for water pipe lines at Seattle and 500 tons at Tacoma, 9000 tons for the Pine Canyon water development at Pasadena, 2800 tons for a line from the El Capitan Dam to the Lakeside line at San Diego and 12,000 tons now actively open for a natural gas transmission line for the Pacific Gas & Electric Co. at San Francisco.

No appreciable improvement in volume can be seen as yet, although warehouse factors and jobbers report some increase in demand. A most determined attempt to hold the market firm is being made by principal mills and suppliers, in the face of shading by a few mills and sellers of foreign material.

The Pacific Coast mills are operating only intermittently, and further reductions in personnel in both plants and officers are reported. Gradually all factors in the industry are fitting operations to what appears to be a new and greatly diminished normal.

Canadian National is Expected to Buy Rails

TORONTO, March 28.—An announcement made in the House of Commons a few days ago by R. J. Manion, Minister of Railways and Canals, that 10,000 to 15,000 tons of rails would be required this year for the Atlantic division of the Canadian National Railways. It is understood that the order will go to the Dominion Steel & Coal Co., Sydney, N. S., and will enable the company to resume operations in this department. Nothing was said, however, regarding rails for the central and western lines. The Algoma Steel Corpn. is rolling 100-lb. rails for the Western division of the Canadian Pacific Railway.

Pig Iron

While business the past week was affected to some extent by the Easter holiday season, sales in single car lots were fairly well sustained and reached a total of around 300 tons. No future buying is being done despite the fact that the first quarter is drawing to a close.

Old Material

Sales fell sharply as a result of the holidays. There was only small coverage by a few consumers who were out of stock. Steel scrap continues dull, but more buying is looked for with the steel mills at Sault Ste. Marie in operation. No steel scrap is going to the Hamilton district. Dealers are buying only in special grades. Price lists are unchanged.

St. Louis Trade is Still Waiting for Improvement

ST. LOUIS, March 29.—On the eve of the opening of the second quarter, there are few signs of improvement in the demand for pig iron. The melt of basic iron in the district is slightly off. Jobbing foundries are doing little, although some are awaiting specifications based on contracts expected to be made for the Ford Motor Co. Stove foundries are operating at low ebb. Shipments by the local maker are holding up well. Prices are said to be firm and unchanged.

Steel

Open-hearth furnaces in the St. Louis district are operating, it is estimated, at about 12 per cent of capacity.

Fabricators of structural steel await a readjustment of building trades wages before expecting any sizable local projects to develop. In the meantime, plant operations are estimated to be between 15 and 20 per cent of capacity.

Locomotive shops of the Wabash Railway at Decatur, Ill., were reopened yesterday, giving employment to 1100 men. The railroad expects to hire an additional 1000 men on April 1, which should mean an increased movement of iron and steel.

Business in plates, shapes and bars continues light, but prices are being held on a firm basis.

The St. Louis Structural Steel Co. is low bidder on 20 pontoons and 19 trucks for the United States Engineer at St. Louis, requiring 400 tons of plates.

Old Material

Buying of old material that had been expected to develop by the end of March has not yet materialized. Mills in the district are awaiting the receipt of orders for finished products before contracting for raw material of any kind. Miscellaneous standard-section rails and railroad springs are 50c. a ton lower, and the remainder of the list is nominally unchanged.

Railroad lists: Chicago, Burlington & Quincy, 5320 tons; Union Pacific, 850 tons; New York, Chicago & St. Louis, 24 carloads; Mobile & Ohio, 8 carloads, and Nashville, Chattanooga & St. Louis, 7 carloads.

Cast Iron Pipe

State of Connecticut awarded one mile of 6-in. and two miles of 8-in. for a line between New London and Waterford to R. D. Wood & Co.

Winooski, Vt., placed 145 tons of 6-in. with Warren Pipe & Foundry Corpn.

Natick, Mass., will award 200 tons of 6 and 20-in. on April 1.

Springfield, Mass., has closed bids on 1400 ft. of 8-in.

Binghamton, N. Y., has taken bids on 350 tons of 12-in.

Lancaster, Pa., awarded an unstated tonnage of 48-in. to United States Pipe & Foundry Co.

Lancaster, Ohio, awarded 5000 ft. of 6-in. to unnamed bidders.

Portsmouth, Ohio, placed 125 tons of 6 and 8-in. with American Cast Iron Pipe Co.

Cedar Grove, Wis., ordered 15,000 ft. of 6 and 8-in. Class C from James B. Clow & Son.

Beverly Hills, Cal., awarded 241 tons to United States Pipe & Foundry Co.

Oakland, Cal., opened bids on 575 tons of 6 and 8-in. Class B; United States Pipe & Foundry Co. is low bidder.

Glendale, Cal., opened bids on 600 tons of 6 and 8-in.; R. D. Wood & Co. are low bidder.

La Habra, Cal., will vote on a bond issue on April 11 to provide for a water system, which would include 792 tons of 4 to 12-in.

San Diego is taking bids until April 1 on 243 tons of 4 and 6-in. Class B.

Lynwood, Cal., is opening bids this week on 100 tons of 6 to 12-in. Class 150.

Ben Lomond, Cal., purchased 234 tons of 6-in. Class 250 from United States Pipe & Foundry Co., through Public Utilities Corpn. of California.

Yakima, Wash., rejected all bids unopened on 3½ miles of 16, 20 and 24-in. main, which had been called for March 14.

Seattle placed 125 tons of 12-in. with United States Pipe & Foundry Co.

Olympia, Wash., plans to lay about 442 tons of 4 to 12-in. during 1932.

Seattle will require 593 tons of 20-in. Class B for authorized improvements on Railroad Avenue.

Linwood, Cal., will vote on water system bonds providing for 1414 tons of 6 to 12-in. Class 150.

Burlington, Wash., will vote on bond issue to provide for three miles of water main.

Greeley, Colo., awarded 3½ miles of 20-in. to United States Pipe & Foundry Co.

Trade Notes

Gears & Forgings, Inc., Cleveland, has appointed Carey Machinery & Supply Co., 119-121 East Lombard Street, Baltimore, as a distributer of G&F speed reducers and Falk flexible couplings.

Diamond Chain & Mfg Co., Indianapolis, has appointed the following West Coast representatives: Puget Sound Machinery Depot, Oregon and Washington representative, with stocks at Klamath Falls and Portland, Ore., and Hoquiam and Seattle, Wash.; Joseph D. Christian Engineers, San Francisco, engineering representatives, and Horsford Brothers Co. of the same city, industrial distributer, for northern California. Goddard Jackson Co. is now representative in Los Angeles territory.

E. L. Essley Machinery Co., 551-557 Washington Boulevard, Chicago, has been appointed exclusive sales agent in Chicago, Milwaukee and Minneapolis territories for the complete line of high-speed riveting hammers manufactured by High-Speed Hammer Co., Rochester, N. Y.

Coming Meetings

April

National Metal Trades Association. April 20. Annual meeting, Hotel Astor, New York. J. E. Nyhan, Peoples Gas Building, Chicago, secretary.

Electrochemical Society. April 21 to 23. Annual meeting, Lord Baltimore Hotel, Baltimore, Md. Colin G. Fink, Columbia University, New York, secretary.

American Welding Society. April 27 to 29. Annual meeting, Engineering Societies Building, New York. M. M. Kelly, 33 West Thirty-ninth Street, New York, secretary.

Die Casting Industry to Be Surveyed

WASHINGTON, March 29.—Arrangements have been completed for a survey of the die casting industry of the country by the Department of Commerce, it was announced today by Director Feiker of the Bureau of Foreign and Domestic Commerce. The survey is to be made at the request of the American Die Casting Institute as an aid to more effective economic planning and individual operation in this field.

The survey will consist of two phases. One part will comprise a general study of the industry to be conducted by the questionnaire method. The second phase is to be a special case study of certain specific problems as found in the practice of six or eight specially selected plants.

Pittsburgh Steel Co. Absorbs Subsidiaries

Pittsburgh Steel Co., Pittsburgh, has taken over entire assets and assumed the liabilities of its subsidiaries, Pittsburgh Steel Products Co. and National Steel Fabric Co., according to an announcement by Homer D. Williams, president of the companies. Effective April 1, all business formerly carried on by the subsidiaries will be under the direct management of the parent company. E. W. Smith, general sales manager of the parent company, will have charge of sales of all products.

Vapor Degreaser

The article describing a "Vapor Degreaser" metal-cleaning unit in the March 10 issue of THE IRON AGE, page 622, stated that the unit was developed by Carrier-Brunswick International, Inc., division of Carrier Engineering Corpn., Newark, N. J. The article should have stated that the unit was developed by Carrier-York Corpn., division of Carrier Corpn., 1541 Sansom Street, Philadelphia.

Stibloy Products Co., Inc., Koppers Building, Pittsburgh, has taken over the assets of Liquid Metal Products, Inc., Chicago, producer and distributer, under the Arent patents, of Stibloy, a metal compound in liquid form, which acts as a primary coating to hold paint, enamel and lacquer, permitting immediate finishing of new galvanized metal surfaces. Officers of the Stibloy company are J. N. Forker, president; S. H. Bell, vice-president; John D. Shaner, secretary, and S. T. Brown, treasurer. The company will manufacture its product in various plants of the Koppers Products Co.

▲▲▲ Prices of Finished and Semi-Finished Steel,

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
Del'd Philadelphia	1.91c.
Del'd New York	1.95c.
Del'd Detroit	1.80c.
F.o.b. Cleveland	1.65c.
F.o.b. Lackawanna	1.70c.
F.o.b. Birmingham	1.75c.
C.i.f. Pacific ports	2.00c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.	1.50c. to 1.60c.
F.o.b. Birmingham, mill lengths	1.75c.
F.o.b. Cleveland	1.50c. to 1.55c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.30c. to 1.35c.
F.o.b. Chicago Heights mills	1.50c. to 1.60c.
Del'd Philadelphia	1.49c. to 1.59c.

Iron

Common iron, f.o.b. Chicago	1.70c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.11c.
Common iron, del'd New York	2.15c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c.
Del'd Cleveland	1.8035c.
Del'd Philadelphia	1.7935c.
F.o.b. Coatesville	1.70c.
F.o.b. Sparrows Point	1.70c.
F.o.b. Lackawanna	1.70c.
Del'd New York	1.898c.
C.i.f. Pacific ports	1.85c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Birmingham	1.75c.
F.o.b. Lackawanna	1.70c.
F.o.b. Bethlehem	1.70c.
Del'd Cleveland	1.8035c.
Del'd Philadelphia	1.6495c.
Del'd New York	1.86775c.
C.i.f. Pacific ports (standard)	2.00c.
C.i.f. Pacific ports (wide flange)	2.10c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago mill	2.05c.
F.o.b. Buffalo	2.00c.

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential per 100 Lb.
2000	(½% Nickel)	$0.25
2100	(1¼% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.16 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.50 to 2.00 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bar	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
Chromium Nickel Vanadium		1.50
Carbon Vanadium		0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a section area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Cold-Finished Bars

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.00c.
Bars, f.o.b. Chicago	2.00c.
Bars, Cleveland	1.90c. to 2.00c.
Bars, Buffalo	2.00c.
Shafting, ground, f.o.b. mill	*2.35c. to 3.30c.

*According to size.

SHEETS, STRIP, TIN PLATE, TERNE PLATE

Sheets

Hot-rolled

	Base per Lb.
No. 10, f.o.b. Pittsburgh	1.55c.
No. 10, f.o.b. Chicago mill	1.65c.
No. 10, del'd Philadelphia	1.86c.
No. 10, f.o.b. Birmingham	1.70c.
No. 10, c.i.f. Pacific Coast ports	2.30c.

Hot-Holled and Annealed

No. 10, Pittsburgh	1.70c.
No. 10, Chicago mills	1.80c.
No. 10, Birmingham	1.85c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.20c.
No. 24, f.o.b. Chicago mills	2.30c.
No. 24, del'd Philadelphia	2.46c. to 2.51c.
No. 24, f.o.b. Birmingham	2.35c. to 2.50c.
No. 24, c.i.f. Pacific Coast ports	2.80c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.25c.
No. 10 gage, f.o.b. Chicago mills	2.35c.
No. 10 gage, del'd Philadelphia	2.46c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.75c.
No. 20 gage, f.o.b. Chicago mills	2.85c.
No. 20 gage, del'd Philadelphia	3.06c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	2.90c.

Steel Furniture Sheets

No. 10, f.o.b. Pittsburgh	2.65c.
No. 20, f.o.b. Pittsburgh	3.15c.

(Prices on furniture stock include stretcher leveling but not resquaring.)

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Chicago mills	2.95c.
No. 24, del'd Philadelphia	3.16c.
No. 24, f.o.b. Birmingham	3.00c.
No. 24, c.i.f. Pacific Coast ports	3.45c.

Lon Ternes

No. 24, unassorted, 8-lb. coating, f.o.b. P'gh	2.90c. to 3.00c.

Vitreous Enameling Stock

No. 10, f.o.b. Pittsburgh	2.60c.
No. 20, f.o.b. Pittsburgh	3.10c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.40c. to 2.50c.
No. 28, Chicago mill	2.50c. to 2.60c.

Tin Plate

	Base per Box
Standard cokes, f.o.b. P'gh district mills	$4.75
Standard cokes, f.o.b. Gary	4.85

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)

(Per Package, 20 x 28 in.)

8-lb. coating I.C. $9.50	25-lb. coating I.C. $14.10
15-lb. coating I.C. 12.00	30-lb. coating I.C. 14.96
20-lb. coating I.C. 13.00	40-lb. coating I.C. 16.70

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, Pittsburgh	1.50c. to 1.60c.
Wider than 6 in., P'gh	1.40c. to 1.50c.
6 in. and narrower, Chicago	1.60c. to 1.70c.
Wider than 6 in., Chicago	1.50c. to 1.60c.
Cooperage stock, P'gh	1.60c. to 1.70c.
Cooperage stock, Chicago	1.70c. to 1.80c.

Cold-Rolled Strips

F.o.b. P'gh	2.00c.
F.o.b. Cleveland	2.00c.
Del'd Chicago	2.30c.
F.o.b. Worcester	2.20c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	3.00c.

STEEL PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	47	21½	¼ and ⅜	+9	+34
¼ to ⅜	58	27½	½	25	7
½	58	44½	¾	30	13
¾	62	50½	1 and 1¼	33	17
1 to 3	64	52½	1½ and 2	37	20

Lap Weld

2	57	45½	2	25	11
2½ to 6	61	49½	2½ to 3½	30	15
7 and 8	58	45½	4 to 6	32	19
9 and 10	56	43½	7 and 8	31	18
11 and 12	55	42½	9 to 12	28	13

Butt Weld, extra strong, plain ends

⅛	43	26½	¼ and ⅜	+11	+46
¼ to ⅜	49	32½	½	25	9
½	55	44½	¾	30	14
¾	60	49½	1 to 2	36	20
1 to 1½	62	51½			
2 to 3	63	52½			

Lap Weld, extra strong, plain ends

2	55	44½	2	31	15
2½ to 4	59	48½	2½ to 4	36	22
4½ to 6	58	47½	4½ to 6	35	21
7 to 8	54	41½	7 and 8	33	19
9 and 10	47	34½	9 to 12	23	10
11 and 12	46	33½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discounts of 5 and 2½%, and on galvanized by 1½ points with supplementary discounts of 5 and 2½%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3¼ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. in lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

Per Cent Off List

Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

Bolts, Nuts, Coke, Coal, Fuel Oil, Cast Iron Pipe

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland) (After Dec. 31, extras of 10c. a 100 lb. on mixed and joint carloads, 25c. on pool carloads and 40c. on less than carloads will be applied on all merchant wire products.)

To Manufacturing Trade

Bright wire	2.20c.
Spring wire	3.20c.

To Jobbing Trade

	Base per Keg
Standard wire nails	$1.95
Smooth coated nails	1.95
Galvanized nails	3.95

	Base per Lb.
Smooth annealed wire	2.35c.
Smooth galvanized wire	2.80c.
Polished staples	2.50c.
Galvanized staples	2.75c.
Barbed wire, galvanized	2.60c.
Woven wire fence, No. 9 gage, per net ton	$55.00
Woven wire fence, No. 12½ gage and lighter, per net ton	60.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

RAILS AND TRACK SUPPLIES

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	34.00
Light (from rail steel), f.o.b. mill	32.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅜-in. and larger	$2.60
Spikes, ½-in. and larger	2.60
Spikes, boat and barge	2.80
Tie plate, steel	1.85
Angle bars	2.75
Track bolts, to steam railroads	3.50
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	75
†Carriage bolts	75
Lag bolts	75
Plow bolts, Nos. 1, 2, 3 and 7 heads	75
Hot-pressed nuts, blank or tapped, square	75
Hot-pressed nuts, blank or tapped, hexagons	75
C.p.c. and t. square or hex. nuts, blank or tapped	75
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	75
Semi-finished hexagon castellated nuts, S.A.E.	75
Stove bolts in packages, P'gh	85 and 10
Stove bolts in packages, Ch'go	85 and 10
Stove bolts, in pkgs., Cleveland	85 and 10
Stove bolts in bulk, P'gh	85, 10 and 2½
Stove bolts in bulk, Chicago	85, 10 and 2½
Stove bolts in bulk, Cleveland	85, 10 and 2½
Tire bolts	60 and 10

Discount of 75 per cent off on bolts and nuts applies on carload business with jobbers and large consumers.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.25
F.o.b. Chicago	2.35

Small Rivets

(⅞-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S.S. thread	80, 10 and 10
Upset hex. cap screws, S.A.E. thread	85, 10 and 10
Upset set screws	80, 10 and 5
Milled studs	70

SEMI-FINISHED STEEL

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	$26.00 to $27.00
Rerolling, 4-in. and under 10-in., Youngstown	26.00 to 27.00
Rerolling, 4-in. and under 10-in., Cleveland	26.00
Rerolling, 4-in. and under 10 in., Chicago	29.00
Forging quality, Pittsburgh	33.00 to 34.00
Forging quality, Youngstown	33.00

Sheet Bars

(Open-Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$26.00
Youngstown	26.00
Cleveland	26.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$26.00 to $27.00
Youngstown	26.00 to 27.00
Cleveland	26.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.50c. to 1.60c.
Universal	1.50c. to 1.60c.
Sheared	1.50c. to 1.60c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$37.00
Cleveland	37.00
Chicago	38.00

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.25
Foundry, f.o.b. Connellsville prompt	$3.25 to 4.50
Foundry, by-product, Ch'go ovens	7.50
Foundry, by-product, New England, del'd	10.50
Foundry, by-product, Newark or Jersey City, delivered	8.70 to 9.10
Foundry, by-product, Phila.	9.00
Foundry, by-product, Cleveland, delivered	8.27
Foundry, Birmingham	5.00
Foundry, by-products, St. Louis, f.o.b. ovens	8.00
Foundry, by-products, del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.40 to $1.50
Mine run coking, coal, f.o.b. W. Pa.	1.50 to 1.60
Gas coal, ¾-in., f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	0.40 to 0.60
Gas slack, f.o.b. W. Pa. mines	0.65 to 0.75

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal. f.o.b. Baltimore	
No. 3 distillate	3.50c.
No. 4 industrial	3.25c.
Per Gal. del'd Chicago	
No. 3 industrial fuel oil	2.75c.
No. 5 industrial fuel oil	2.60c.
Per Gal. f.o.b. Cleveland	
No. 3 distillate	4.62½c.
No. 4 distillate	3.87½c.

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$38.00	$25.00 to $30.00
Maryland	38.00	25.00 to 30.00
New Jersey	$44.00 to 57.00	
Ohio	38.00	25.00 to 30.00
Kentucky	38.00	25.00 to 30.00
Missouri	35.00	30.00
Illinois	38.00	25.00 to 30.00
Ground fire clay, per ton	6.50	

Chrome Brick

	Per Net Ton
Standard size	$42.50

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$38.00
Chicago	47.00
Birmingham	50.00
Silica clay, per ton	8.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$61.50
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	33.50
Domestic, f.o.b. Chewelah, Wash.	20.90

CAST IRON PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$36.40 to $38.40
4-in., del'd Chicago	39.40 to 41.40
6-in. and larger, del'd New York	$28.20
4-in., del'd New York	31.20
6-in. and larger, Birmingham	$32.00 to 33.00
4-in., Birmingham	$35.00 to $36.00

Class "A" and gas pipe, $3 extra.

Pig Iron Prices for All Districts

VALLEY

Per gross ton, f.o.b. Valley furnace:

Basic	$14.50
Bessemer	15.50
Gray forge	15.00
No. 2 foundry	15.00
No. 3 foundry	14.50
Malleable	15.50
Low phos., copper free	25.00

Freight rate to Pittsburgh or Cleveland district, $1.89.

PITTSBURGH

Per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$15.00
No. 2 foundry	16.00
No. 3 foundry	15.50
Malleable	16.00
Bessemer	16.00

Freight rates to points in Pittsburgh district range from 69c. to $1.26.

CHICAGO

Per gross ton at Chicago furnace:

N'th'n No. 2 fdy.	$16.50
N'th'n No. 1 fdy.	17.00
Malleable, not over 2.25 sil.	16.50
High phosphorus	16.50
Lake Super. charcoal, sil. 1.50, by rail	23.17
S'th'n No. 2 fdy.	16.14
Low phos., sil. 1 to 2, copper free	$28.50 to 29.20
Silvery, sil, 8 per cent	23.67
Bess. ferrosilicon, 15 per cent	28.92

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnaces, not including a switching charge.

ST. LOUIS

Per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$17.50
Malleable, f.o.b. Granite City	17.50
N'th'n No. 2 fdy., del'd St. Louis	18.80
Southern No. 2 fdy., del'd	$14.56 to 15.56
Northern malleable, deliv'd	18.80
Northern basic, deliv'd	18.80

Freight rates 83c. (average) Granite City to St. Louis; $2.30 from Chicago; $4.56 from Birmingham.

NEW YORK

Per gross ton, delivered New York district:

*Buffalo, No. 2, del'd east. N. J.	$17.91 to $18.41
East. Pa. No. 2 fdy.	16.52 to 17.02
East. Pa. No. 2X fdy.	17.02 to 17.52

Freight rates: $1.52 to $2.63 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.41 a ton from Buffalo.

BUFFALO

Per gross ton, f.o.b. furnace:

No. 2 fdy.	$16.00
No. 2X fdy.	16.50
No. 1 fdy.	17.50
Malleable, sil. up to 2.25	16.50
Basic	15.50
Lake Superior charcoal, del'd	23.41

NEW ENGLAND

Per gross ton delivered to most New England points:

*Buffalo, sil. 1.75 to 2.25	$19.54 to $20.04
*Buffalo, sil. 2.25 to 2.75	19.54 to 20.04
*Ala., sil. 1.75 to 2.25	19.74
*Ala., sil. 2.25 to 2.75	20.24
†Ala., sil. 1.75 to 2.25	15.88
†Ala., sil. 2.25 to 2.75	16.28

Freight rates: $5.04 all rail from Buffalo; $9.75 all rail from Alabama and $5.88 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

CINCINNATI

Per gross ton, delivered Cincinnati:

Ala. fdy., sil. 1.75 to 2.25	$13.82
Ala. fdy., sil. 2.25 to 2.75	14.32
Tenn. fdy., sil. 1.75 to 2.25	13.82
N'th'n No. 2 foundry	$17.01 to 17.59
S'th'n Ohio silvery, 8 per cent	22.02

Freight rates, $2.02 from Ironton and Jackson, Ohio; $3.82 from Birmingham.

PHILADELPHIA

Per gross ton at Philadelphia:

East. Pa. No. 2	$15.59 to $16.09
East. Pa. No. 2X	16.09 to 16.59
East. Pa. No. 1X	16.59 to 17.09
Basic (del'd east. Pa.)	16.00
Malleable	18.00 to 18.50
Stand. low phos. (f.o.b. east. Pa. furnace)	22.00 to 23.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 22.50
Va. No. 2 plain	22.04
Va. No. 2X	22.54

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 84c. to $1.79 from eastern Pennsylvania furnaces; $4.67 from Virginia furnaces.

CLEVELAND

Per gross ton at Cleveland furnace:

N'th'n No. 2 fdy. (local delivery)	$15.50
S'th'n fdy., sil. 1.75 to 2.25	16.14
Malleable (local delivery)	15.50
Ohio silvery, 8 per cent	21.87
Stand. low phos., Valley	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 55c. average local switching charge; $3.12 from Jackson, Ohio; $6.14 from Birmingham.

BIRMINGHAM

Per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$11.00
No. 2 soft, 2.25 to 2.75 sil.	11.50
Basic	11.00

CANADA

Per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	$23.00 to 23.50

Prices of Ores, Ferroalloys and Fluorspar

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian	8c. to 8.50c.
Iron, low phos., Swedish, aver. 68% iron	9.00c.
Iron, basic or foundry, Swedish, average 65% iron	8.00c.
Iron, basic and foundry, Russian, aver. 63% iron (nom.)	9.00c.
Manganese, Caucasian, washed 52%	24.00c.
Manganese, African, Indian, 50-52%	23c. to 24c.
Manganese, Brazilian, 46 to 48%	21c. to 22c.

	Per Gross Ton
Tungsten, Chinese wolframite	$10.75 to $11.00
Tungsten, domestic scheelite	10.00 to 10.50
Chrome, 45% Cr_2O_3 crude, c.i.f. Atlantic seaboard	$18.00
Chrome, 48% Cr_2O_3, c.i.f. Atlantic seaboard	20.00

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	*$72.00 to $75.00
Foreign, 80%, Atlantic or Gulf port, duty paid	*72.00 to 75.00

*Minimum price quoted for lots of 2000 tons or more.

Spiegeleisen

Per Gross Ton Furnace

Domestic, 10 to 21% ..... $26.00 to $27.00

Electric Ferrosilicon

Per Gross Ton Delivered

50% (carloads)	$77.50
50% (less carload)	85.00
75% (carloads)	126.00
75% (less carloads)	136.00
14% to 16% (f.o.b. Welland, Ont., in carloads)	31.00
14% to 16% (less carloads)	36.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
10%	$20.50	14%	$23.50
11%	21.00	15%	24.00
12%	21.50	16%	25.00
13%	22.50	17%	26.50

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
6%	$18.00	12%	$20.50
7%	18.50	13%	21.50
8%	18.75	14%	22.50
9%	19.00	15%	23.00
10%	19.50	16%	24.00
11%	20.00	17%	25.50

Other Ferroalloys

Ferrotungsten, per lb. wn. del., carloads	$1.08
Ferrotungsten, less carloads	$1.15 to 1.25
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	10.00c.
Ferrochromium, 2% carbon	17.00c. to 17.50c.
Ferrochromium, 1% carbon	19.00c. to 20.00c.
Ferrochromium, 0.10% carbon	23.50c. to 25.00c.
Ferrochromium, 0.06% carbon	25.50c. to 27.00c.
Ferrovanadium, del., per lb. contained Va.	$3.05 to $3.30
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base per gross ton	85.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Ferrophosphorus, electric, 24%, f.o.b. Anniston, Ala., per gross ton	$113.50
Silico spiegel, per ton, f.o.b. furnace, car lots	42.50
Ton lots or less, per ton	47.50
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	105.00
1% carbon grade	115.00
Spot prices	$5 a ton higher

Flurospar

	Per Net Ton
Domestic, washed gravel, 85-5, Kentucky and Illinois mines, freight allowed, Pittsburgh basis	$20.31
No. 2 lump, 85-5, Kentucky and Illinois mines, freight allowed, Pittsburgh basis	22.31
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	$17.00 to 17.40
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	32.00

Old Material Quotations

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$10.00 to	$10.50
No. 2 heavy melting steel	8.75 to	9.25
No. 2 railroad wrought	10.00 to	10.50
Scrap rails	10.00 to	10.50
Rails 3 ft. and under	12.00 to	12.50
Sheet bar crops, ordinary	10.00 to	10.50
Compressed sheet steel	9.75 to	10.25
Hand bundled sheet steel	8.75 to	9.25
Hvy. steel axle turnings	9.00 to	9.50
Machine shop turnings	6.75 to	7.25
Short shov. steel turnings	6.75 to	7.25
Short mixed borings and turnings	6.75 to	7.25
Cast iron borings	6.75 to	7.25
Cast iron carwheels	9.75 to	10.25
Heavy breakable cast	8.00 to	8.50
No. 1 cast	9.00 to	10.00
Railr. knuckles and couplers	10.50 to	11.00
Rail. coil and leaf springs	10.50 to	11.00
Rolled steel wheels	10.50 to	11.00
Low phos. billet crops	13.00 to	13.50
Low phos. sheet bar crops	12.50 to	13.00
Low phos. plate scrap	11.00 to	11.50
Low phos. punchings	11.00 to	11.50
Steel car axles	15.00 to	15.50

CHICAGO

Delivered Chicago district consumers:

Per Gross Ton

Heavy melting steel	$7.00 to	$7.25
Shoveling steel	7.00 to	7.25
Frogs, switches and guards	7.00 to	7.25
Hydraulic comp. sheets	5.75 to	6.25
Drop forge flashings	5.00 to	5.50
No. 1 busheling	5.25 to	5.75
Rolled carwheels	7.50 to	8.00
Railroad tires	9.00 to	9.50
Railroad leaf springs	8.50 to	9.00
Axle turnings	5.75 to	6.25
Steel couplers and knuckles	7.75 to	8.25
Coil springs	9.50 to	10.00
Axle turnings (elec. fur.)	6.00 to	6.50
Low phos. punchings	9.50 to	10.00
Low phos. plates, 12 in. and under	9.00 to	9.50
Cast iron borings	4.00 to	4.50
Short shoveling turnings	4.00 to	4.50
Machine shop turnings	3.50 to	4.00
Rerolling rails	9.50 to	10.00
Steel rails, less than 3 ft.	9.25 to	9.75
Steel rails, less than 2 ft.	10.00 to	10.50
Angle bars, steel	8.25 to	8.75
Cast iron carwheels	7.00 to	7.50
Railroad malleable	6.50 to	7.00
Agricultural malleable	6.00 to	6.50
*Relaying rails, 56 to 60 lb.	15.00 to	17.00
*Relay. rails, 65 lb. and up	18.00 to	23.00

Per Net Ton

Iron angle and splice bars	$6.50 to	$7.00
Iron arch bars, transoms	6.50 to	7.00
Iron car axles	12.50 to	13.50
Steel car axles	9.00 to	9.50
No. 1 railroad wrought	5.50 to	6.00
No. 2 railroad wrought	6.25 to	6.50
No. 1 busheling	4.75 to	5.25
No. 2 busheling	2.50 to	3.00
Locomotive tires, smooth	8.00 to	9.00
Pipes and flues	3.25 to	3.75
No. 1 machinery cast	7.00 to	7.50
Clean automobile cast	6.75 to	7.25
No. 1 railroad cast	6.50 to	7.00
No. 1 agricultural cast	5.75 to	6.25
Stove plate	5.25 to	5.75
Grate bars	5.25 to	5.75
Brake shoes	6.75 to	7.25

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$7.00 to	$7.50
No. 2 heavy melting steel	5.50 to	6.00
No. 1 railroad wrought	8.50 to	9.00
Bundled sheets		6.00
Hydraulic compressed, new	6.00 to	6.50
Hydraulic compressed, old	5.00 to	5.50
Machine shop turnings	4.00 to	4.50
Heavy axle turnings	6.00 to	6.50
Cast borings (nom.)		3.50
Heavy breakable cast		9.00
Stove plate (steel works)		7.00
No. 1 low phos. hvy	10.00 to	11.00
Couplers and knuckles	8.00 to	8.50
Rolled steel wheels	8.00 to	8.50
No. 1 blast furnace		3.50
Spec. iron and steel pipe	8.00 to	8.50
Shafting	12.50 to	13.50
Steel axles	14.50 to	15.00
No. 1 forge fire		6.00
Cast iron carwheels	9.50 to	10.00
No. 1 cast	9.50 to	10.00
Cast borings (chem.)	10.00 to	11.00
Steel rails for rolling	9.50 to	10.00

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$7.25 to	$7.75
No. 2 heavy melting steel	6.50 to	7.00
Compressed sheet steel	7.00 to	7.25
Light bundled sheet stampings	6.00 to	6.50
Drop forge flashings	6.00 to	6.25
Machine-shop turnings	4.00 to	4.25
Short shoveling turnings	5.75 to	6.25
No. 1 busheling	6.50 to	6.75
Steel axle turnings	7.50 to	8.00
Low phos., billet crops	14.00 to	14.50
Cast iron borings	5.75 to	6.00
Mixed borings and short turnings	5.75 to	6.00
No. 2 busheling	5.75 to	6.00
No. 1 cast	9.00 to	9.50
Railroad grate bars	6.00 to	6.50
Stove plate	6.00 to	6.50
Rails under 3 ft.	12.00 to	12.50
Rails for rolling	11.00 to	12.00
Railroad malleable	9.50 to	10.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	$7.50	
No. 2 heavy melting scrap	6.00 to	$6.50
Scrap rails	8.00 to	8.50
New hydraul. comp. sheets	6.00 to	6.50
Old hydraul. comp. sheets	5.00 to	5.50
Drop forge flashings	6.00 to	6.50
No. 1 busheling	6.00 to	6.50
Hvy. steel axle turnings		7.00
Machine shop turnings		5.00
Knuckles and couplers		10.00
Coil and leaf springs		10.00
Rolled steel wheels		10.00
Low phos. billet crops	12.00 to	12.50
Short shov. steel turnings	6.50 to	7.00
Short mixed borings and turnings	6.00 to	6.50
Cast iron borings	6.00 to	6.50
No. 2 busheling	3.50 to	4.00
Steel car axles	10.00 to	11.00
Iron axles	12.00 to	12.50
No. 1 machinery cast	9.25 to	9.75
No. 1 cupola cast	8.75 to	9.00
Stove plate	8.25 to	8.75
Steel rails, 3 ft. and under	11.00 to	11.50
Cast iron carwheels	9.00 to	9.50
Industrial malleable	9.00 to	9.50
Railroad malleable	9.00 to	9.50
Chemical borings	8.50 to	9.00

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	$7.50 to	$8.00
Scrap steel rails	7.50 to	8.00
Short shoveling turnings	3.50 to	4.00
Stove plate		6.00
Steel axles		12.00
Iron axles		12.00
No. 1 railroad wrought		6.00
Rails for rolling	9.00 to	9.50
No. 1 cast	8.50 to	9.00
Tramcar wheels		8.50
Cast iron borings, chem		8.50

ST. LOUIS

Dealers' buying prices per gross ton:

Selected heavy steel	$7.00 to	$7.50
No. 1 heavy melting	6.25 to	6.75
No. 2 heavy melting	5.75 to	6.25
No. 1 locomotive tires	6.00 to	6.50
Misc. stand-sec. rails	7.00 to	7.50
Railroad springs	8.00 to	8.50
Bundled sheets	4.25 to	4.75
No. 2 railroad wrought	6.25 to	6.75
No. 1 busheling	5.50 to	6.00
Cast iron borings and shoveling turnings	4.75 to	5.25
Iron rails	7.00 to	8.00
Rails for rolling	8.50 to	9.00
Machine shop turnings	3.00 to	3.50
Heavy turnings	5.00 to	5.50
Steel car axles	9.50 to	10.00
Iron car axles	12.50 to	13.00
Wrot. iron bars and trans.	5.00 to	5.50
No. 1 railroad wrought	4.75 to	5.25
Steel rails, less than 3 ft.	8.50 to	9.00
Steel angle bars	6.50 to	7.00
Cast iron carwheels	6.00 to	6.50
No. 1 machinery cast	8.00 to	8.50
Railroad malleable	5.00 to	5.50
No. 1 railroad cast	5.75 to	6.25
Stove plate	6.00 to	6.50
Relay. rails, 60 lb. and under	16.00 to	16.50
Relay. rails, 70 lb. and over	20.00 to	21.00
Agricult. malleable	5.00 to	5.50

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$4.25 to	$5.50
No. 2 heavy melting steel		4.00
Heavy melting steel (yard)	2.75 to	3.00
No. 1 hvy. breakable cast	5.00 to	5.50
Stove plate (steel works)	3.00 to	3.50
Machine shop turnings	1.00 to	1.50
Short shoveling turnings	1.00 to	1.50
Cast borings	1.00 to	1.50
No. 1 blast furnace	1.00 to	1.50
Steel car axles	10.00 to	10.50
Iron car axles (nom.)	14.00 to	14.50
Spec. iron and steel pipe	3.00 to	3.50
Forge fire		3.25
No. 1 railroad wrought	5.00 to	5.25
No. 1 yard wrought, long	4.00 to	4.25
Rails for rolling	6.00 to	6.25
No. 1 cast	5.75 to	6.00
No. 2 cast	5.00 to	5.50
Stove plate (foundry)	4.75 to	5.25
Malleable cast (railroad)	6.00 to	6.50
Cast borings (chemical)	7.00 to	7.50

Per gross ton, delivered local foundries:

No. 1 machinery cast		$8.50
No. 1 hvy. cast (cupola size)		7.50
No. 2 cast		6.50

BOSTON

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$4.00 to	$4.25
Scrap T rails	3.80 to	4.60
Machine shop turnings	1.25 to	1.50
Cast iron borings		1.05
Bundled skeleton, long		2.50
Forge flashings	3.00 to	3.50
Blast furnace scrap	0.90 to	1.00
Forge scrap	3.00 to	3.25
Shafting	9.50 to	10.00
Steel car axles	9.00 to	9.50
Wrought pipe	4.00 to	4.25
Rails for rolling	6.00 to	6.50
Cast iron borings, chemical	7.00 to	7.25

Per gross ton delivered consumers' yards:

Textile cast	$7.50 to	$8.00
No. 1 machinery cast	8.00 to	8.50
Stove plate	5.00 to	5.25
Railroad malleable	10.50 to	11.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$6.00 to	$7.00
Scrap rails for melting	8.00 to	8.50
Loose sheet clippings	2.00 to	2.50
Bundled sheets	4.75 to	5.25
Cast iron borings	2.75 to	3.25
Machine shop turnings	3.25 to	3.75
No. 1 busheling	4.25 to	4.75
No. 2 busheling	2.50 to	3.00
Rails for rolling	9.00 to	9.50
No. 1 locomotive tires	8.50 to	9.00
Short rails	11.75 to	12.25
Cast iron carwheels	8.25 to	8.75
No. 1 machinery cast	10.00 to	10.50
No. 1 railroad cast	8.75 to	9.25
Burnt cast	4.25 to	4.75
Stove plate	4.25 to	4.75
Agricultural malleable	8.00 to	8.50
Railroad malleable	9.00 to	9.50

DETROIT

Dealers' buying prices per gross ton:

Hvy. melting	$5.75 to	$6.25
Borings and short turnings	4.00 to	4.50
Long turnings	3.25 to	3.75
No. 1 machinery cast	8.50 to	9.00
Automotive cast	10.75 to	11.25
Hydraul. comp. sheets	5.75 to	6.25
Stove plate	4.50 to	5.00
New No. 1 busheling	4.75 to	5.25
Old No. 2 busheling	3.00 to	3.50
Sheet clippings	3.25 to	3.75
Flashings	4.75 to	5.25

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$7.00	$6.00
Rails, scrap	7.00	6.00
No. 1 wrought	6.00	8.00
Machine shop turnings	2.00	2.00
Boiler plate	5.00	4.50
Heavy axle turnings	2.50	2.50
Cast borings	2.00	2.00
Steel borings	2.00	2.00
Wrought pipe	2.00	2.00
Steel axles	7.00	9.00
Axles, wrought iron	7.00	11.00
No. 1 machinery cast	12.50	10.00
Stove plate	10.00	8.00
Standard carwheels	11.00	8.50
Malleable	10.00	8.00

Warehouse Prices for Iron and Steel Products

CHICAGO

Base per Lb.

Plates and structural shapes	3.00c.
Soft steel bars	2.75c.
Reinforcing bars, billet steel	1.75c.
Rail steel reinforcement	1.55c. to 1.65c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.10c.
Flats and squares	3.60c.
Bands, ¼ in. (in Nos. 10 and 12 gages)	2.95c.
Hoops (No. 14 gage and lighter)	3.50c.
Hot-rolled annealed sheets (No. 24)	3.55c.
Galv. sheets (No. 24)	4.10c.
Hot-rolled sheets (No. 10)	3.20c.
Spikes (⅜ in. and lighter)	3.45c.
Track bolts	4.30c.
Rivets, structural	3.75c.
Rivets, boiler	3.75c.

Per Cent Off List

Machine bolts	73
Carriage bolts	73
Coach and lag screws	73
Hot-pressed nuts, sq., tap. or blank	73
Hot-pressed nuts, hex., tap. or blank	73
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	2.30
Cement c't'd nails, base per keg	2.30

CLEVELAND

Base per Lb.

Plates and struc. shapes	2.95c.
Soft steel bars	2.75c.
Reinforc. steel bars	1.75c. to 1.95c.
Cold-fin. rounds and hex	3.10c.
Cold-fin. flats and sq	3.60c.
Hoops and bands, No. 12 to ⅜ in., inclusive	3.00c.
Hoops and bands, No. 13 and lighter	3.55c.
Cold-finished strip	*5.55c.
Hot-rolled annealed sheets (No. 24)	3.25c.
Galvanized sheets (No. 24)	3.75c.
Hot-rolled sheets (No. 10)	3.00c.
Black ann'l'd wire, per 100 lb	$2.75
No. 9 galv. wire, per 100 lb	3.20
Com. wire nails, base per keg	2.35

*Net base, including boxing and cutting to length.

CINCINNATI

Base per Lb.

Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
New billet reinforc. bars	3.00c.
Rail steel reinforc. bars	3.00c.
Hoops	3.90c.
Bands	3.20c.
Cold-fin. rounds and hex	3.50c.
Squares	4.00c.
Hot-rolled annealed sheets (No. 24)	3.75c.
Galv. sheets (No. 24)	4.25c.
Hot rolled sheets (No. 10)	3.30c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb	$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.65
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg	2.95
Chain, per 100 lb	10.25

Net per 100 Ft.

Seamless steel boiler tubes, 2-in.	$17.50
4-in.	36.00
Lap-welded steel boiler tubes, 2-in.	16.50
4-in.	34.50

BUFFALO

Base per Lb.

Plates and struc. shapes	3.25c.
Soft steel bars	3.00c.
Reinforcing bars	2.65c.
Cold-fin. flats and sq	3.65c.
Rounds and hex	3.15c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.10c.
Bands	3.35c.
Hoops	3.90c.
Hot-rolled sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$2.45
Black wire, base per 100 lb	3.20

NEW YORK

Base per Lb.

Plates and struc. shapes	2.70c. to 3.10c.
Soft steel bars, small shapes	2.70c. to 3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	6.00c. to 6.50c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Hot-rolled sheets (No. 10)	3.00c. to 3.25c.
Hot-rolled ann'l'd sheets (No. 24*)	3.60c.
Galvanized sheets (No. 24*)	4.00c.
Long terne sheets (No. 24)	5.00c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.60c.
Wire, galv. annealed (No. 10)	4.05c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases,	4.50c. to 7.00c.
Common wire nails, base, per keg	$2.60

Machine bolts, cut thread:	Per Cent Off List
¾ x 6 in. and smaller	65 to 65 and 10
1 x 20 in. and smaller	65 to 65 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	65 to 65 and 10
¾ x 20 in. and smaller	65 to 65 and 10

Boiler Tubes:	Per 100 Ft.
Lap welded, 2-in.	$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

Base per Lb.

Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
Cold-fin. rounds, shafting, screw stock	3.35c.
Hot-rolled annealed sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.35c.
Hot-rolled sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	3.85c.
Galv. corrug. sheets	4.40c.
Structural rivets	4.00c.
Boiler rivets	4.00c.

Per Cent Off List

Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb	60
Machine bolts	73
Carriage bolts	73
Lag screws	73
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	73
Less than 200 lb	63
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	73
Less than 200 lb	63

PACIFIC COAST

	Base per Lb. San Francisco	Los Angeles	Seattle
Plates and struc. shapes, ¼-in. and heavier	3.15c.	3.15c.	2.75c.
Soft steel bars	3.15c.	3.15c.	2.75c.
Reinforcing bars	2.80c.	2.80c.	3.00c.
Hot-rolled annealed sheets (No. 24)	3.95c.	4.05c.	4.25c.
Hot-rolled sheets (No. 10)	3.50c.	3.50c.	3.75c.
Galv. sheets (No. 24)	4.55c.	4.35c.	4.75c.
Struc. rivets, ½ in. and larger, less than 1000 lb	5.00c.	5.00c.	4.00c.
Cold-finished steel bars and shafting:			
Rounds	5.25c.	5.15c.	4.50c.
Squares	6.25c.	6.15c.	5.75c.
Hexagons	6.25c.	5.15c.	5.75c.
Flats	6.75c.	6.15c.	6.75c.
Common wire nails, base per keg in less carloads	$2.75	$2.75	$2.75

Plates, shapes, bars, bands and hot-rolled sheets, No. 16 gage and heavier, subject to group differentials.

Cold-finished steel bars and shafting, subject to warehouse differentials for quantity.

All prices f.o.b. warehouse.

PITTSBURGH

*Base per Lb.

Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.60c.
Reinforcing steel bars	2.60c.
Cold-finished and screw stock—	
Rounds and hexagons	3.10c.
Squares and flats	3.60c.
Bands	2.95c.
Hoops	3.60c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.15c.
Galv. sheets (No. 24), 25 or more bundles	3.65c.
Hot-rolled sheets (No. 10)	3.10c.
Galv. corrug. sheets (No. 28), per square (less than 3750 lb.)	$3.74
Spikes, large	2.50c.
Small	2.75c. to 2.90c.
Boat	3.00c.
Track bolts, all sizes, per 100 count,	70 and 10 per cent off list
Machine bolts, 100 count,	70 and 10 per cent off list
Carriage bolts, 100 count,	70 and 10 per cent off list
Nuts, all styles, 100 count,	73 and 10 per cent off list
Large rivets, base per 100 lb	$3.00
Wire, black, soft ann'l'd, base per 100 lb.	2.75
Wire, galv. soft, base per 100 lb	3.20
Common wire nails, per keg	2.35
Cement coated nails, per keg	2.35

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

PHILADELPHIA

Base per Lb.

Plates, ¼-in. and heavier	2.45c.
Structural shapes	2.45c.
Soft steel bars, small shapes, iron bars (except bands)	2.45c.
Reinforc. steel bars, sq., twisted and deform	2.30c.
Cold-fin. steel, rounds and hex	3.30c.
Cold-fin. steel, sq. and flats	3.80c.
Steel hoops	3.00c.
Steel bands, No. 12 to ⅛-in., inclu.	2.75c.
Spring steel	5.00c.
Hot-rolled annealed sheets (No. 24)	3.55c.
Galvanized sheets (No. 24)	3.50c.
Hot-rolled and annealed sheets (No. 10)	3.05c.
Diam. pat. floor plates, ¼ in.	5.00c.
Swedish iron bars	6.60c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

BOSTON

Base per Lb.

Plates	*3.35c.
Structural shapes	*3.35c.
Soft steel bars, small shapes	*3.25c.
Reinforcing bars	3.10c. to 3.25c.
Iron bars—	
Refined	3.25c.
Best refined	4.60c.
Spring steel, open-hearth	5.00c.
Tire steel	4.50c. to 4.75c.
Bands	*3.75c. to 4.25c.
Hoop steel	4.90c. to 5.40c.
Cold-rolled steel—	
Rounds and hex	3.50c. to 5.50c.
Squares and flats	4.00c. to 6.00c.
Rivets, structural or boiler	4.80c.

Per Cent Off List

Machine bolts	70
Carriage bolts	70
Lag screws	70
Hot-pressed nuts	40 and 10
Cold-punched nuts	40 and 10
Stove bolts	70 and 10

*Base price (250 to 999 lb.); less than 250 lb., add 50c. per 100 lb.; 1000 to 7999 lb., deduct 15c.; 8000 to 14,999 lb., deduct 25c.; 15,000 lb. and larger lots, deduct 35c.

Copper Firm Despite Inactivity; Lead Lower; Tin Easier

NEW YORK, March 29.—Despite a lack of consumer interest in electrolytic copper, the market reflects a firm tone. Leading producers continue to quote 6c. a lb., delivered Connecticut Valley. Improved deliveries in March against contracts are expected to effect a slight reduction in refined copper stocks. Copper Exporters, Inc., has established its official quotation at 6.25c. a lb., c.i.f. usual foreign ports, a reduction of ⅝c. from the former official price of 6.62½c. The special quotation of 6.12½c. was withdrawn last Thursday. Owing to the week-end holiday abroad, export bookings have fallen off. Total export bookings thus far in March amount to about 19,000 tons, compared with 29,000 tons for the entire month of February.

The Phelps-Dodge Corpn. issued a statement last week that it will suspend for an indefinite period its operations in Arizona at Ajo on April 24 and at Morenci on July 1. When these curtailment plans are effected, the company's output will be reduced to about 20 per cent of capacity.

Lead

Following the reduction in prices last week to 3c., New York, and 2.90c., St. Louis, a substantial amount of buying was transacted for April delivery. As a result, about two-thirds of consumer requirements are now covered for that month. The improved demand is expected to result in a better balance of production and consumption.

Tin

A fair volume of spot business continues. Domestic prices are somewhat easier, with today's quotation 21.90c. Activity in the London market today was brisk, with spot sales of 200 tons and futures of 1600 tons having been made. Today's London quotation is £118 2s. 6d. a ton for spot standard, £119 10s. for future standard and £121 7s. 6d. for spot Straits. The Singapore market today is £126. Shipments from the East up to March 26 aggregate 4129 tons, indicating that the total shipments for the month will not measure up to the estimate for March of 5500 tons. United Kingdom warehouse stocks increased 40 tons last week and now stand at 33,510 tons. It is reported that the Tin Producers' Association has agreed to a further curtailment of 10 per cent in production, effective either May 1 or June 1.

Zinc

Significant developments in this market in the past week have been absent. Demand is quiet, with the leading producers exerting little selling pressure. Although some metal is being offered at 2.80c., East St. Louis, and 3.17c., New York, zinc is still available at 2.77½c., East St. Louis, and 3.14½c., New York. The output of rolled zinc in the United States in 1931 amounted to 116,669,925 lb., valued at $8,313,383, compared with the 1930 output of 102,769,995 lb., valued at $8,671,409, according to the United States Bureau of Mines.

Antimony

In the absence of transactions, prices are nominal at 6.12½c., f.o.b. New York, for spot, and about 3.75c., c.i.f. New York, for futures.

The Week's Prices. Cents Per Pound for Early Delivery

	Mar. 23	Mar. 24	Mar. 25	Mar. 26	Mar. 28	Mar. 29
Lake copper, New York	6.12½	6.12½	6.12½	6.12½	6.12½	6.12½
Electrolytic copper, N. Y.*	5.75	5.75	5.75	5.75	5.75	5.75
Straits tin, spot, N. Y.	21.75	21.75	21.75	....	22.10	21.20
Zinc, East St. Louis	2.77½	2.77½	2.77½	2.77½	2.77½	2.77½
Zinc, New York	3.14½	3.14½	3.14½	3.14½	3.14½	3.14½
Lead, St. Louis	2.90	2.90	2.90	2.90	2.90	2.90
Lead, New York	3.00	3.00	3.00	3.00	3.00	3.00

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel, electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 6.12½c. a lb., New York.
Brass ingots, 85-5-5-5, 6.25c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	24.00c. to 25.00c.
Tin, bar	26.00c. to 28.00c.
Copper, Lake	8.00c. to 9.00c.
Copper, electrolytic	7.75c. to 8.75c.
Copper, casting	7.50c. to 8.50c.
*Copper sheets, hot-rolled	15.37½c.
*High brass sheets	12.50c.
*Seamless brass tubes	15.75c.
*Seamless copper tubes	14.87½c.
*Brass rods	10.25c.
*Brazed brass tubes	21.62½c.
Zinc, slab	4.00c. to 4.50c.
Zinc sheets (No. 9), casks	9.25c. to 9.50c.
Lead, American pig	4.00c. to 4.50c.
Lead, bar	5.75c. to 6.75c.
Lead sheets	7.50c.
Antimony, Asiatic	9.00c. to 10.00c.
Alum., virgin, 99 per cent plus	23.30c.
Alum. No. 1 for remelting, 98 to 99 per cent.	17.00c. to 18.00c.
Solder, ½ and ⅓	15.00c. to 16.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

Metals from Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	26.25c.
Tin, bar	28.25c.
Copper, Lake	7.25c.
Copper, electrolytic	7.25c.
Copper, casting	7.00c.
Zinc, slab	4.25c. to 4.50c.
Lead, American pig	3.75c. to 4.00c.
Lead, bar	7.25c.
Antimony, Asiatic	10.00c.
Babbitt metal, medium grade	15.00c.
Babbitt metal, high grade	29.75c.
Solder, ½ and ⅓	17.50c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	4.50c.	5.25c.
Copper, hvy. and wire	4.25c.	5.00c.
Copper, light and bottoms	3.50c.	4.25c.
Brass, heavy	2.25c.	2.75c.
Brass, light	1.75c.	2.50c.
Hvy. machine composition	3.50c.	4.00c.
No. 1 yel. brass turnings	2.50c.	3.00c.
No. 1 red brass or compos. turnings	3.00c.	3.50c.
Lead, heavy	2.00c.	2.50c.
Zinc	1.00c.	1.375c.
Cast aluminum	3.50c.	5.00c.
Sheet aluminum	8.50c.	10.50c.

New Pig Iron Firm Is Organized in Chicago

Bauer-Wilson & Co., 310 South Michigan Avenue, Chicago, has been organized as a partnership by Fred W. Bauer and T. L. Wilson to engage in a general business in pig iron, coke, alloys and kindred products. The firm has been appointed exclusive agent for pig iron produced by the Woodward Iron Co., Woodward, Ala., in northern Indiana, northern Illinois, western Michigan, Wisconsin and Minnesota. The firm will also represent, among other producers, the Niagara Falls Smelting & Refining Corpn., Buffalo.

Mr. Bauer was formerly vice-president in charge of Chicago district sales for Rogers-Brown & Crocker Brothers. He served the company for 28 years. Mr. Wilson was for a number of years district sales manager for Walter Wallingford & Co. and previously had been resident manager at Chicago for Hickman, Williams & Co. He had previously been in the operating department of Illinois Steel Co., South Works.

Fabricated Structural Steel

Detroit Post Office Will Take 7500 Tons—New Projects Larger

THE oustanding structural steel awards for the week are a post office in Detroit, which will require 7500 tons, and a power house for the General Electric Co. at Schenectady, 1250 tons. Total lettings call for 12,350 tons, compared with 10,300 tons in the previous week. New inquiries, at 15,000 tons, are among the largest for the year. Projects include 3000 tons for highway bridges at Ottawa and Channahon, Ill.; 2500 tons for the Hershey Chocolate Co., Hershey, Pa., and 1000 tons for a post office in Chattanooga. Awards follow:

NORTH ATLANTIC STATES

Revere, Mass., 112 tons, dance pavilion, to New England Structural Co.

Springfield, Mass., 150 tons, service building for General Electric Realty Co., to American Bridge Co.

Schenectady, N. Y., 1250 tons, power house for General Electric Co., to American Bridge Co.

Edgley, Pa., 940 tons, building for Paterson Parchment Paper Co., to Belmont Iron Works.

THE SOUTH

Alexandria, Va., 650 tons, Ford Motor Co. service building, to Belmont Iron Works.

CENTRAL STATES

Detroit, 7500 tons, post office, to McClintic-Marshall Corpn.

State of Indiana, 400 tons, highway bridge, to Central States Bridge & Structural Co.

Indianapolis, 500 tons, highway bridge, to Vincennes Bridge Co.

Madison County, Iowa, 300 tons, highway spans, to Pittsburgh-Des Moines Steel Co.

WESTERN STATES

Superior, Mont., 190 tons, highway truss span, to Minneapolis-Moline Power Implement Co.

San Francisco, 125 tons, apartment building, to McClintic-Marshall Corpn.

Los Angeles, 500 to 1000 tons, sheet steel piling for city, to Inland Steel Co.

Los Angeles, 110 tons, Roosevelt High School, to McClintic-Marshall Corpn.

Beverly Hills, Cal., 105 tons, high school, to Pacific Iron & Steel Co.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Boston, 100 tons, Boston College of Pharmacy.

Yonkers, N. Y., 250 tons, laundry building; bids April 13.

New York, 450 tons, garage in Bronx.

New York, 900 tons, apartment building at Park Avenue and Seventy-second Street.

Brooklyn, 250 tons, addition to Cascade Steam Laundry.

Long Island City, N. Y., 560 tons, garage.

Port Richmond, Staten Island, 250 tons, pier No. 11.

Hershey, Pa., 2500 tons, plant addition for Hershey Chocolate Co.

Albion, N. Y., 400 tons, high school.

Elmira, N. Y., 100 tons, grade crossing elimination.

Washington, 4500 tons, post office; bids on general contract postponed to April 8.

THE SOUTH

Chattanooga, Tenn., 1000 tons, post office.

New Orleans, 275 tons, paper and pulp mill.

Baton Rouge, La., 500 tons, post office.

CENTRAL STATES

Cleveland, 140 tons, building for Cleveland Heater Co.

Cleveland, 900 tons, foundations for Cleveland post office, to be placed by Cleveland Union Terminal Co.

Chicago, 800 tons, general exhibition buildings for Century of Progress Exposition.

Chicago, 180 tons, Sixteenth Street bridge.

Rockford, Ill., 700 tons, post office.

DePere, Wis., 1600 tons, State highway bridge; bids rejected, new bids March 29.

Savanna, Ill., 265 tons, bridge approach.

St. Louis, 3000 tons, municipal auditorium.

Columbus Junction, Iowa, 600 tons, highway bridge.

Ottawa and Channahon, Ill., 3000 tons, highway bridges.

WESTERN STATES

Vannuys, Cal., 225 tons, city hall.

Long Beach, Cal., 260 tons, bridges for Pacific Electric Railway.

Stockton, Cal., 600 tons, water front development structures; bids close April 4.

Pomona, Cal., 175 tons, grandstand for County fair grounds.

Gladstone, Ore., 889 tons, Clackamas River highway bridge; Lindstrom & Feigenson, low bidder on general contract.

FABRICATED PLATE

AWARDS

Lynchburg, Ky., 100 tons, balancing tank for city, to Pittsburgh-Des Moines Steel Co.

New York, 300 tons, two tanks for L. M. Vidal, to Hammond Iron Works.

Schenectady, N. Y., 305 tons, stack and hoppers for General Electric Co., to American Bridge Co.

Riverside, Cal., 100 tons, tank and tower at March Field, to Pittsburgh-Des Moines Steel Co.

Los Angeles, 105 tons, tank for United States Engineers Office, to Pittsburgh-Des Moines Steel Co.

NEW PROJECTS

St. Louis, 400 tons, 20 pontoons and 19 trucks for United States Engineer; St. Louis Structural Steel Co., low bidder.

Hoover Dam, 60,000 to 70,000 tons; tunnel lining, to be placed in three to five months.

Reinforcing Steel

Awards 2800 Tons—New Projects 4800 Tons

AWARDS

Bucks County, Pa., 100 tons, highway work, to Kalman Steel Co.

Nashville, Tenn., 300 tons, State highway bridges, to Dudley Bar Co.

Springfield, Mo., 720 tons, Federal hospital for defective delinquents, to Sheffield Steel Corpn.

Minneapolis, 390 tons, Sheridan School, to Laclede Steel Co.

Salt Lake City, 100 tons, Saltair highway bridge, to an unnamed bidder by Christensen & Gardner, general contractor.

Camp Verde, Ariz., 100 tons, State highway structures, to Concrete Engineering Co.

Los Angeles, 100 tons, Upper Hollywood municipal reservoir, to Concrete Engineering Co.

Bellingham, Wash., 100 tons, Twelfth Street State highway bridge, to Northwest Steel Rolling Mills.

Los Angeles, 150 tons, Venice Boulevard bridge, to Blue Diamond Corpn.

Mare Island, Cal., 137 tons, Navy Yard battery building, to Pacific Coast Steel Co.

Glendale, Cal., 100 tons, county conduit, to Blue Diamond Corpn.

Seattle, 162 tons, city viaduct, to Pacific Coast Steel Co.

Fairbanks, Alaska, 325 tons, post office and courthouse, to Bethlehem Steel Co., Seattle.

NEW REINFORCING BAR PROJECTS

State of Vermont, 300 tons, State road; letting April 8.

Westchester County, N. Y., 200 tons, road work for County park commission.

New York, 142 tons, extension to Sofia Brothers, Inc., warehouse.

Long Island City, 200 tons, Gibson Art Co. building.

Long Island City, 100 tons, garage.

Elmira, N. Y., 500 tons, grade crossing elimination.

Washington, 1000 tons, post office (revised from 400 tons which had included floors only); bids for general contract postponed to April 8.

Baton Rouge, La., 150 tons, post office.

Louisville, Ky., 100 tons, Veterans' Hospital.

Chicago, tonnage not estimated, Marine Hospital; bids to be asked soon.

Chicago, 1000 tons, United States Appraisers Stores; bids to be taken soon.

San Francisco, 300 tons, Pier No. 92.

Seattle, 275 tons, Kirkland Road viaduct.

Long Beach, Cal., 200 tons, structures for eight-mile Union Pacific Railway cut-off.

San Jose, Cal., 225 tons, San Carlos Street viaduct for Southern Pacific Railway.

Riverside, Cal., 247 tons, State highway structures, bids close April 6.

Glendale, Cal., 100 tons, Sycamore Wash conduit for Los Angeles County; bids closed March 21.

Santa Ana, Cal., 150 tons, County bridge; bids close April 12.

Stockton, Cal., 500 tons, water front development structures; bids close April 4.

Sacramento, Cal., 122 tons, H Street County bridge.

San Diego, Cal., 125 tons, mausoleum.

Honolulu, 100 tons, Kress store.

Pipe Lines

Southern Counties Gas Co., Los Angeles, is in the market for 68 miles of 12¾-in. gas pipe, requiring approximately 10,000 tons of steel.

Southern Counties Gas Co., Los Angeles, operated by Pacific Lighting Corpn., same place, is arranging for a 75-mile natural gas pipe line from Huntington Beach to Rose Canyon, La Jolla, Cal., where connection will be made with system of San Diego Consolidated Gas & Electric Co. New pipe line will have capacity of 24,000,000 cu. ft. daily. Cost about $1,000,000.

Columbia Gas & Electric Co., New York, is arranging for 20-in. pipe line from Muncie, Ind., to Detroit, about 200 miles, to be used for natural gas supply at last noted place. United Light & Power Co., Chicago, is interested in project.

Northern Natural Gas System, City National Bank Building, Omaha, Neb., let contract to Reece McGee Construction Co., Blackwell, Okla., for 4-in. pipe line from David City to Schuyler, Neb., about 14 miles, and for 8-in. pipe line from last noted place to Columbus, Neb., about 15 miles, also for natural gas distributing system at Schuyler.

Cincinnati opened bids on 1940 ft. of 24-in. dredge pipe for United States Engineers; Treadwell Construction Co., Midland City, Pa., is low bidder.

Railroad Equipment

Philadelphia & Reading Coal & Iron Co. has ordered 100 mine cars from Bethlehem Steel Co.

Great Northern has placed an order with Baldwin Locomotive Works for three 88-in. locomotive boilers.

Combination Forge Furnace and Steam Boiler Saves Fuel

(*Concluded from page* 773)

the required point, when the regulator automatically shuts off four of them. When a considerable volume of work is being put under the hammers the steam consumption is immediately increased and all seven burners fire to capacity.

While the furnace will heat steel to the forging temperature with three burners, it will heat it enough faster, with all six going, to supply the greater demand of the hammer crew. In other words, capacities of furnace and boiler not only balance nicely, but respond quickly to any demand of the hammer crew. This is directly due to the flexibility of the volume of fuel supply and its quick response to the automatic controls.

Addition of a water regulator and a steam water pump render the steam boiler entirely automatic. The regulator is cut into a steam line from the boiler to the pump. When the water level drops below a certain point, a float valve in the steam line opens and steam passes to the pump. When the pump has forced enough water into the boiler, the float valve rises to its former position and cuts off the steam supply.

A test run of two days was made on the forge served with the 30-hp. firetube boiler. Half of the test was with large pieces of steel which practically filled the forge, while the other half was on small pieces only partly filling the heating chamber. The forge was operated at about 50 per cent of its capacity and heated 5080 lb. of steel to about 2200 deg. F.

Input of gas to the forge was 49,120 cu. ft. If the boiler had been operated as a separate and independent unit, with efficiency of 70 per cent, it would have required 46,500 cu. ft. of gas to raise the equivalent amount of steam. Thus 95,620 cu. ft. of gas would have been necessary to operate furnace and boiler as separate units. Actually, however, with the waste gases utilized, the combination forge and boiler used only 74,500 cu. ft. of gas. The difference of 21,120 cu. ft. represents a saving of about 22 per cent. As this was accomplished with the forge operating at only about half its maximum capacity, still greater savings are possible.

Another possibility of saving fuel in a forge shop, when the power load is intermittent, is by use of a steam accumulator, to store steam in off-load periods for use at times of peak load. During low-load periods an automatic control system directs into the accumulator all steam generated by the boilers, but not immediately wanted at the hammers. The accumulator contains water at saturation temperature. The entering steam is condensed and gives up to the water its latent heat. Both temperature and pressure within the tank gradually rise during such periods of charging.

Whenever the hammer demand exceeds the supply from the boilers, the same control system causes a drop in pressure within the tank. Ebullition occurs and the heat introduced with the charging steam is recovered in the steam discharged. Water is flashed into steam at a high rate, corresponding with the pressure drop and extent of evaporative surface. In practice the rate at which steam can be withdrawn from the accumulator is limited only by the size of outlet connection. Ample steam will, therefore, always be available to cover peaks and the steam flow from the boilers will not be affected. Smaller or fewer boilers will thus serve for handling full output.

Bearing Metals As Made and Used Today

(*Concluded from page* 776)

Both materials have been in a state of development during recent years and indications now are that they will be perfected to a remarkable degree. The extreme hardness of these two materials will involve the development of new hard bearing material. Several of such early materials are reported as giving satisfactory results. It is, however, too early as yet to go on record as to the results.

A Protest Against Improper Tooling

A comprehensive review of the bearing metals would indeed be incomplete without alluding to improper tooling. For more than 20 years the writer has protested against tooling bearings in a manner that would disturb the natural crystallization to an unnecessary amount upon the bearing surface.[7] Since all of the disturbed metal produced by improper tooling on a bearing surface must be worn off completely before a properly run-in surface can be formed, the writer has consistently protested against the use of the standard multiple cutting edge reamer for finishing bearing surfaces; likewise for all broaching and similar processes.[8]

The final finishing of bearings should be done with the sharpest possible tool, light cut and at a high speed (Figs. 4 and 5). This argument is now fully confirmed by the motor car builders, who have, during recent years, used a diamond for cutting their babbitted surfaces in their connecting rods. The long life and success which this practice has given them is due to proper tooling.

[7] Gilmore Points, September, 1931. F. F. Gilmore & Co., Boston.

[8] *Trans.* A.S.M.E., 1919, page 791.

France Establishes Quotas for Sheet Imports

Import quotas for the importation into France of automobile body sheets and electrical sheets have been established by a decree published in the French Journal Officiel for March 18, 1932, according to a cablegram to the the Department of Commerce from Commercial Attaché Fayette W. Allport, Paris.

Monthly quotas are fixed as follows for the period from March 1 to June 30, 1932: Polished flat sheets of iron or steel for automobile bodies; a total quota of 200 metric tons, of which an individual quota of 60 metric tons is fixed for imports from the United States; flat iron or steel sheets containing more than 0.5 per cent of silicon, a total quota of 58.3 metric tons, of which an individual quota of 2.9 metric tons is fixed for imports from the United States.

U. S. Motor Production Lower in February

WASHINGTON, March 29.—The February production of motor vehicles in the United States totaled 117,413 units, against 119,344 in January, according to reports received by the Bureau of the Census. The output in February consisted of 94,085 passenger cars, 23,303 trucks and 25 taxicabs.

The Canadian production rose to 5477 in February from 3731 in January and comprised 4494 passenger cars and 983 trucks.

The purchasing department of the Socony-Vacuum Corpn., 26 Broadway, New York, is now making all purchases in behalf of Standard Oil Co. of New York, Vacuum Oil Co., Socony-Vacuum Specialties and Standard-Vacuum Transportation Co.

PLANT EXPANSION AND EQUIPMENT BUYING

Machine Tool Buying Makes No Headway

March Ends Less Hopefully Than It Began as Fresh Uncertainties Crop Out

MARCH ends less hopefully than it began in the machine tool trade. There were slight signs of improvement early in the month, but fresh uncertainties have been created by the inability of the House of Representatives to agree on a tax bill, the long delay in the Ford production program and a decline in steel production. Prospective buyers of machine tools have been awaiting signs of general improvement in industrial production before making purchases.

Not only have orders slowed up, but there are very few live inquiries. The expected showing of the new Ford automobiles during the next week raises hopes of a favorable reaction on the entire motor car industry and an improved tone in related industries.

Some Government work is actively pending, but word from Washington is that Federal expenditures are being kept at a minimum, and some purchases for which appropriations have been made may be indefinitely postponed or abandoned entirely unless absolutely essential.

The demand for used tools has fallen off except where prices are unusually low.

New York

Machine tool buying in this district is virtually at a standstill. Activity the past week was below that of the first half of the month. The local machine tool trade is of the opinion that fresh uncertainties have delayed the plans of manufacturers who use metal-working tools. The protracted debate in Congress in framing a tax bill, the delay in the Ford production program and the decline in steel production are held to be factors in the further slowing up of machine tool buying. Dealers had detected some slight signs of improvement early in the month.

Cleveland

The machine tool market continues dull. Manufacturers and dealers report an almost total absence of live inquiries. The trade is not hopeful that much, if any, of the business that has been pending for some time will result in actual orders until industrial conditions show a change for the better. The volume of business in March aggregated about the same as that in February. A survey of railroads in this territory indicates that little, if any, business can be expected from that source for some time.

Milwaukee

With the expected showing of the new Ford models this week, the machine tool trade is heartened by the hope of a favorable reaction upon the automobile industry, with consequent brightening of prospects for new equipment. There has been no tangible improvement in business otherwise, although inquiry continues moderately active. Foundries and machine shops have not been able to make much, if any, headway in production and tools are being ordered only when the most urgent replacements are needed.

Pittsburgh

While sales of machine tools this month have been slightly ahead of the corresponding February period with most dealers, no definite upward trend is yet discernible. Inquiry continues to appear in fair volume, but much of it is for estimating purposes and no immediate orders are expected.

The Pittsburgh Board of Education placed orders last week for woodworking machinery to be used in high school manual training shops. Some Government work is actively pending. The Pennsylvania Railroad has made no decision regarding rebuilding its Twelfth Street shops at Altoona, Pa., and is taking care of some work ordinarily carried on there at Juniata, Pa. No other railroad buying seems to be under consideration and the larger industrial companies in this district which usually issue lists are inactive.

Chicago

Machine tool orders remain at so low a point that dealers are again revamping their organizations more closely to fit the situation. There is less activity in used tools except where prices are unusually low. At several points where machine equipment is being liquidated the movement is reported as very slow. Job shops are operating on part time.

Cincinnati

New business is confined to scattered orders for single small tools, but no real buying trend is noted. Plant operations remain low, with some closing alternate weeks.

◀ NEW YORK ▶

Titanium Pigment Co., 60 John Street, New York, affiliated with National Lead Co., 111 Broadway, is purchasing site at South Amboy, N. J., for new plant, to include a machine shop. Cost over $1,000,000 with equipment.

Bauer-Stahl Body Corpn., Long Island City, recently organized by Albert F. Bauer, 2915 Thirty-ninth Avenue, to manufacture motor truck and other automobile bodies, has leased building at 38-10 Twenty-fourth Street for new plant.

Port of New York Authority, 80-90 Eighth Avenue, New York, John F. Galvin, chairman, asks bids until April 25 for ventilation equipment for tunnel approach of George Washington bridge over Hudson River, including motor-driven blower fans, exhaust fans and accessories.

Signal Supply Officer, Army Base, Brooklyn, asks bids until April 4 for quantity of cable (Circular 110); until April 12 for quantity of electro tube rectifiers (Circular 108).

Vendome Display Mfg. Corpn., New York, has been organized by S. A. Cohen, 535 Canal Street, New York, and John O. Tulenko, 88 Kensington Street, Jersey City, N. J., to manufacture display fixtures and equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 5 for two fire extinguishing units for naval air station at Lakehurst, N. J. (Schedule 7736).

D. R. Bittan Sales Co., Inc., 27 Park Place, New York, manufacturer of radio equipment and devices, has leased floor in building at 34 East Twelfth Street for new plant.

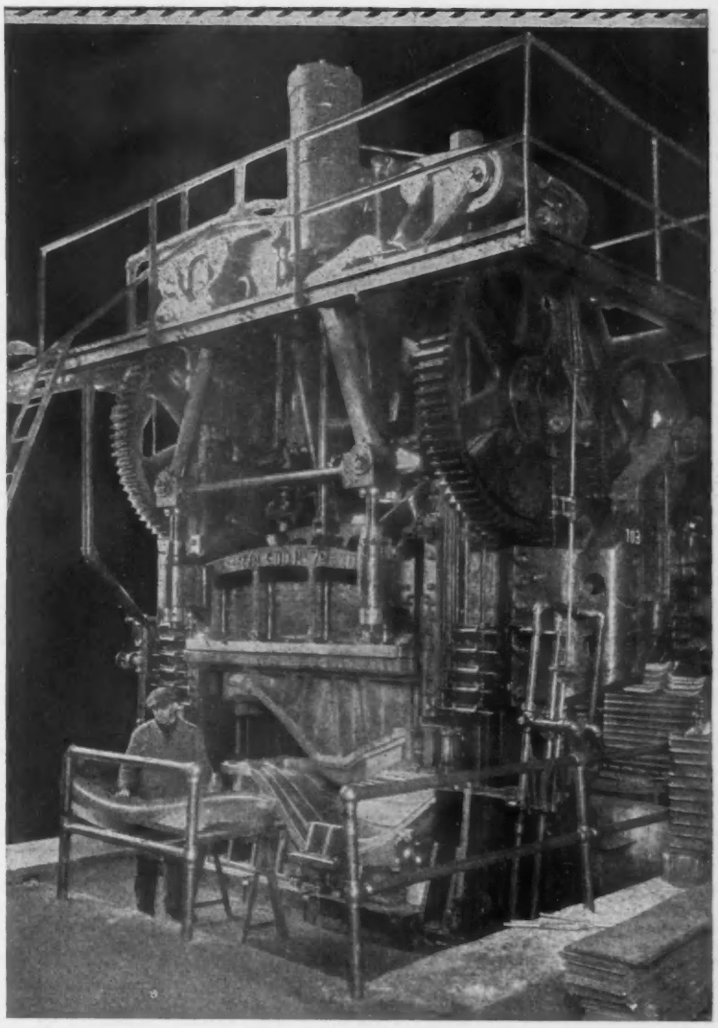
Boundary Line Repair & Electrical Service, Inc., Long Island City, has been organized by Anton Korwan, 25-64 Thirty-first Street, Long Island City, and Samuel Shieber, 160-16 Jamaica Avenue, Jamaica, L. I., to operate mechanical and electrical repair and construction works.

John W. Patience, 110 West Fortieth Street, New York, builder and contractor, has secured general contract from Department Quartermaster, Panama Canal, for erection of two air corps hangars, machine shop and warehouse at Albrook Field, Canal Zone, at $175,000.

Edison Cement Co., 261 Fifth Avenue, New York, an interest of Thomas A. Edison, Inc., West Orange, N. J., has purchased former plant of Building Materials Corpn., Raritan Township, N. J., for $177,500. Plant will be remodeled for new cement mill. Cost about $500,000 with machinery. Operating company will be known as Metropolitan Cement Corpn.

Nusbaum's Body Service, Inc., 148 Bleecker Street, Newark, operating automobile body repair works, has leased one-story building for new plant.

THUNDERING PRESSES
give their Verdict!



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IRON & STEEL
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D. R. Bittan Sales Co., Inc., 27 Park Place, New York, manufacturer of radio equipment and devices, has leased floor in building at 34 East Twelfth Street for new plant.

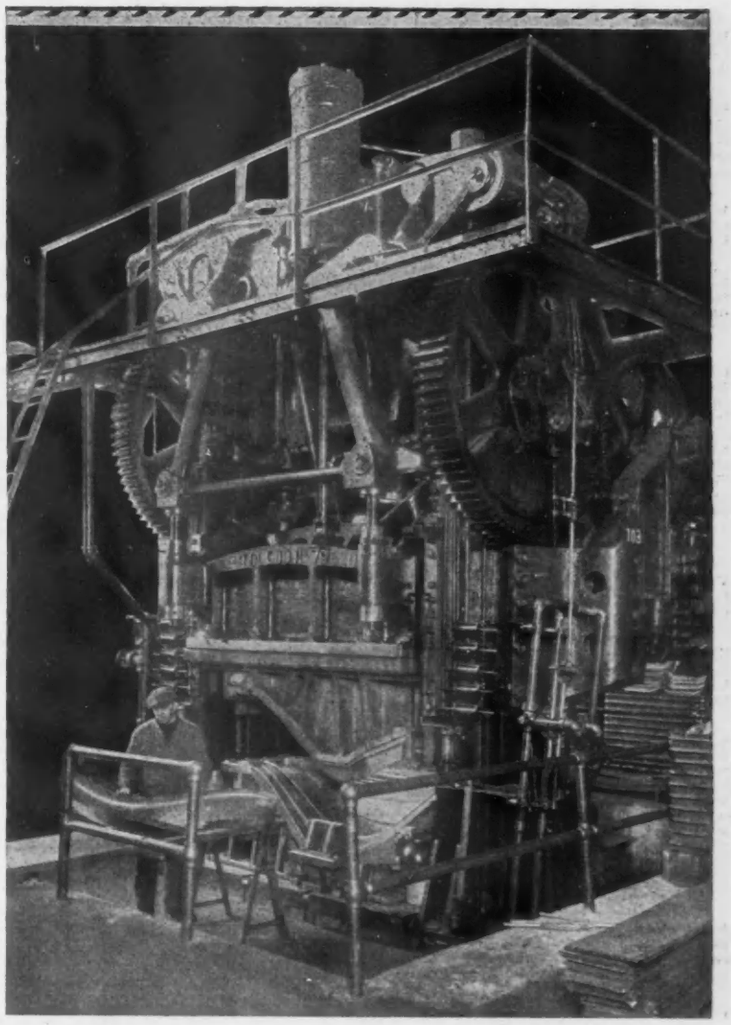
Boundary Line Repair & Electrical Service, Inc., Long Island City, has been organized by Anton Korwan, 25-64 Thirty-first Street, Long Island City, and Samuel Shieber, 160-16 Jamaica Avenue, Jamaica, L. I., to operate mechanical and electrical repair and construction works.

John W. Patience, 110 West Fortieth Street, New York, builder and contractor, has secured general contract from Department Quartermaster, Panama Canal, for erection of two air corps hangars, machine shop and warehouse at Albrook Field, Canal Zone, at $175,000.

Edison Cement Co., 261 Fifth Avenue, New York, an interest of Thomas A. Edison, Inc., West Orange, N. J., has purchased former plant of Building Materials Corpn., Raritan Township, N. J., for $177,500. Plant will be remodeled for new cement mill. Cost about $500,000 with machinery. Operating company will be known as Metropolitan Cement Corpn.

Nusbaum's Body Service, Inc., 148 Bleecker Street, Newark, operating automobile body repair works, has leased one-story building for new plant.

THUNDERING PRESSES
give their Verdict!



Okeh! **Battering presses in scores of stamping and drawing plants have tried Armco sheets and strip and found their prime yield high. ● Again and again these custom-made metals are given "clean bills"—in auto-body plants, in washing machine factories, in furniture factories, and in many other industries where sheet metal is blanked, drawn, formed or spun. ● The yield is consistently high because Armco sheets and strip are engineered to the job. The user's needs are studied intimately and the correct metal produced to do the work economically, from first operation to last. ● Let us show you how this is done. At your request an experienced Armco Engineer will make a thorough survey of your requirements. Just write to the nearest office and appoint the time.**

The American Rolling Mill Co.

Executive Offices: Middletown, Ohio

DISTRICT OFFICES: *Boston . Cleveland Chicago . Detroit . Middletown New York . Philadelphia . Pittsburgh St. Louis . San Francisco*

ARMCO . . . On the Air—
Every Monday Night—WLW
9:00—9:30 E. S. T.

ARMCO
IRON & STEEL
SHEETS
Custom Made
TO MEET YOUR NEEDS

ARMCO

"PIONEERS IN CONTINUOUS SHEET ROLLING"

Mercer Pipe & Fittings, Inc., Bayonne, N. J., care of Maurice A. Cohen, 497 Broadway, has been organized by John J. Holmes, Bayonne, and associates, to manufacture plumbing equipment and supplies, pipe, fittings, etc.

SOUTH ATLANTIC

Ford Motor Co., Dearborn, Mich., let general contract to Belmont Iron Works, Philadelphia, for one-story assembling, distributing and service plant, 200 x 400 ft., at Alexandria, Va. Installation will include an enameling department, and concrete loading dock. Cost over $100,000 with equipment. Albert Kahn, Inc., Detroit, is architect and engineer.

Continental Lacquer Corpn., 410 West Conway Street, Baltimore, plans rebuilding of portion of plant, recently destroyed by fire. Loss over $50,000 with equipment.

Board of District Commissioners, District Building, Washington, asks bids until April 5 for one gasoline-driven portable air compressor.

Baltimore and Ohio Railroad Co., Baltimore, is increasing production at shops at Baltimore, Cumberland, Md., and Newark, Ohio, from four to five-day week, effective April 1, with employment of about 2000 men. About 600 workers have been reinstated at Newark shops.

Chief of Engineers, United States Army, Washington, asks bids until April 6 for quantity of controller cable and cable reels (Circular 20).

John M. Reiser & Sons, 620 Portland Street, Baltimore, manufacturer of wirebound kegs, barrels, etc., is considering new one-story plant, 50 x 125 ft. Cost over $35,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids unail April 19 for four motor-driven pipe-cutting and threading machines and spare parts for Brooklyn, Philadelphia, Mare Island and Puget Sound navy yards (Schedule 7759); until April 12 for one motor-driven centrifugal pump for New York or San Francisco yard (Schedule 7752); 75 aircraft compasses (Schedule 7733), and 50 10-hp. motors, controllers and spare parts (Schedule 7746) for Washington yard; until April 5 for quantity of insulated cable (Schedule 7734) for Norfolk Navy Yard.

Nelson Vertical Paper Cutter Co., Norfolk, Va., has been organized by Oscar L. Gilbert, Bowdens Ferry Road, and associates, to manufacture paper cutters and kindred equipment.

Newport Contracting & Engineering Co., Lee Hall, Va., has contract for erection of engineering and aircraft overhaul shop at Pearl Harbor, T. H., for Bureau of Yards and Docks, Washington.

Royal Silver Mfg. Co., Norfolk, Va., is concentrating its steel knife cutlery business in its modern plant on Georgia Avenue, and preparing its older plant at Twenty-second Street and Colonial Avenue to make a counter-mounted wrapping-paper holder. It is considering adding chromium plating to its present silver and nickel plating equipment.

PHILADELPHIA

Commanding Officer, Frankford Arsenal, Philadelphia, asks bids until April 4 for one motor-driven automatic screw machine (Circular 399), one storage heater for hot water service (Circular 400).

Kellett Autogiro Corpn., affiliated with Kellett Aircraft Corpn., Atlantic Building, Philadelphia, manufacturer of autogiro aircraft with plant on Island Road, is arranging financing about 200,000 shares of stock, part of proceeds to be used for increased production.

Hartranft & Cairne, Philadelphia, manufacturers of iron, brass, bronze and other metal castings, have leased one-story building at Sixteenth and Fitzwater Streets, on site 32 x 169 ft., for new foundry.

Paterson Parchment Paper Co., 33 Eighth Street, Passaic, N. J., let general contract to F. G. Pittet Construction Co., 9 Colt Street, Paterson, N. J., for two-story addition to mill at Edgely, Pa., 90 x 200 ft. Cost about $80,000 with equipment. Haenichen Engineering Co., 222 West Broadway, Paterson, is engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, and Navy Yard, Philadelphia, asks bids until April 5 for two motor-driven drilling and tapping machines (Schedule 7739), one belt-driven 36-in. stone mill (Schedule 7740), quantity of steel bars (Schedule 7668); until April 12 for 35 aircraft accelerometers (Schedule 7753), quantity of electric receptacles, instrument board lighting fixtures, etc. (Schedule 7729) for Philadelphia Navy Yard.

Glen Alden Coal Co., Scranton, Pa., will install new steam power plant at Lance Colliery, near Plymouth, Pa., removing station from Pettebone Colliery to that location and increasing capacity. Cost over $70,000 with equipment.

National Casket Co., 2041-43 Arch Street, Philadelphia, will proceed with superstructure for four-story and basement factory branch, storage and distributing plant, 45 x 155 ft. Cost over $85,000 with equipment. Company headquarters are at Boston. Gustavus A. Young, McCarthy Building, Syracuse, N. Y., is architect.

United Electric Light & Power Co., New York, has ordered three large Taylor stokers from American Engineering Co., Philadelphia, for installation in Hell Gate power station, New York. Work will start April 1 and be completed by Sept. 1.

NEW ENGLAND

Board of School Trustees, Hamden, Conn., has authorized installation of manual training department in new two and three-story school. Bids will be asked soon on general contract. Cost over $250,000. R. W. Foote, New Haven, Conn., is architect.

New England Terminal Co., Quincy, Mass., Matthew P. Sheahan, 46 Bates Avenue, head, has plans for bulk oil storage and distributing plant on Neponset River where 74 acre tract has been acquired. Plant will consist of nine buildings, with tanks and pumping plant to provide for handling 860,000 bbl. oil at one time. Cost about $1,500,000 wtih equipment.

Quality Products Mfg. Corpn., Watertown, Mass., has been organized by Elva L. and Roscoe A. Pickens, 192 Pleasant Street, capital $50,000, to manufacture oil burners and kindred equipment.

Silent Glow Oil Burner Corpn., Hartford, Conn., manufacturer of oil burners and oil-burning equipment, has acquired Midwest Oil Burner Mfg. Co., 3227 Carroll Avenue, Chicago, manufacturer of industrial oil burners. Chicago plant will be moved to Hartford later, where increased production will be carried out in factory on Park Street.

L. W. Ferdinand & Co., Cambridge, Mass., manufacturers of ship chandlery and equipment, has purchased three-story and basement factory at East Canton and Albany Streets for new plant, replacing factory destroyed by fire last month.

Suburban Gas Co., Providence, R. I., plans new loading plant for liquified petroleum gas at Pontiac, R. I., including storage tanks, loading facilities, etc.

GULF STATES

Commercial Pulp & Paper Co., Orange, Tex., recently organized to take over local mill of Yellow Pine Paper Mill Co., will soon begin expansion and improvements for production of coated papers, waxed papers and kindred stocks. Sumner M. Bump is president.

Humble Oil & Refining Co., Houston, Tex., has acquired oil properties of Cullen & West, near Clear Lake, Tex., for $20,000,000, and plans expansion and development. Humble company has disposed of oil properties in Powell oilfield, near Corsicana, Tex., to Olsen Brothers, Corsicana, who will operate in future.

John Remonte, Corpus Christi, Tex., is at head of project to establish plant for manufacture of electric refrigerators, with other units for natural gas and kerosene operation, including parts production and assembling. Refrigerator cabinets will be built at another location.

San Angelo Foundry & Machine Co., San Angelo, Tex., has approved increase in capital from $40,000 to $100,000 for expansion.

Fellsmere Sugar Co., Fellsmere, Fla., recently organized, is considering erection of cane sugar refinery, with power house, machine shop and auxiliary units. Cost over $100,000 with machinery. F. W. Heise is head.

City Council, Springer, N. M., plans installation of pumping machinery and auxiliary equipment for extensions and improvements in municipal waterworks. Bond issue of $60,000 is being arranged. Weiland Engineering Co., Thatcher Building, Pueblo, Colo., is engineer.

Wilson Spring & Bumper Works, Inc., Fort Worth, Tex., has been organized by E. M. Wilson, 2112 Fairmount Street, to manufacture automobile springs, bumpers and other kindred equipment.

East Texas Refining Co., Henderson, Tex., is carrying out expansion and improvements, including installation of additional equipment.

PITTSBURGH

Pittsburgh Equitable Meter Co., Pittsburgh, has purchased outstanding stock of Merco-Nordstrom Valve Co. and Merco-Nordstrom Mfg. Co., Oakland, Cal. Equipment from Merco-Nordstrom plant at Philadelphia is being removed to Pittsburgh company's plant at 400 Lexington Avenue, but remainder of Merco-Nordstrom production will be continued on Pacific Coast.

United States Engineer Office, Huntington, W. Va., asks bids until April 5 for pumps and tanks (Circular 169).

Pittsburgh Water Heater Co., 193 Chartiers Avenue, Pittsburgh, manufacturer of water heaters, parts, etc., will establish assembling plant at Brantford, Ont., for Canadian trade.

Board of Public Education, Administration Building, Bellefield Avenue, Pittsburgh, asks bids until April 6 for electric oven for Perry high school, oxygen, acetylene, hardware and other school equipment. H. W. Cramblet is secretary.

Brockway Machine Bottle Co., Brockway, Pa., has plans for one-story and basement addition, 35 x 100 ft. R. G. Howard, National Bank Building, DuBois, Pa., company architect

CLEVELAND

Graham Instrument Co., Cleveland, leased part of former plant of Stearns Automobile Co., Euclid Avenue and Lakeview Road, N. E., about 5000 sq. ft. floor space, for new works.

Pennsylvania Power Co., Youngstown, Ohio, is disposing of bond issue of $2,500,000, portion of proceeds to be used for extensions and improvements in plants and system.

C. Aronson, 2509 East Thirty-fifth Street, Cleveland, plans one-story addition, 38 x 90 ft., for copper-working shop.

Zanesville Malleable Co., Moxahala Avenue, Zanesville, Ohio, J. S. Phillis, trustee in bankruptcy, will hold public sale of property April 11, including equipment.

Board of Trustees, Oberlin College, Oberlin, Ohio, has plans for steam power plant for central heating service. Cost close to $300,000 with equipment. John Paul Jones, Cary & Miller, Inc., Terminal Tower Building, Cleveland, architect and engineer.

Midway Pattern Co., Inc., Cleveland, care of A. E. Goldhamer, 602 Cuyahoga Building, has been organized by H. Burstein and associates to manufacture metal and wood patterns.

City Ice & Fuel Co., 6611 Euclid Avenue, Cleveland, will build electric-operated cold storage plant at Elyria, Ohio. Company has purchased property at Geneva, Ohio, for similar plant. Both units will cost over $90,000 with machinery.

CHICAGO

City Council, Whitehall, Ill., plans call for bids in April for municipal electric light and power house, including Diesel engine-generator unit, exciter, switchboard equipment and auxiliaries. Cost over $70,000 with machinery.

Standard Oil Co. of Indiana, 910 South Michigan Avenue, Chicago, is planning new bulk oil storage and distributing plant at Butte, Mont. Cost about $55,000 with equipment.

Universal Cooler Corpn., 617 Fulton Street, Chicago, manufacturer of electric refrigerators and equipment, will establish branch plant at Brantford, Ont., for Canadian trade. Factory has been leased.

Board of City Commissioners, Colorado Springs, Colo., has engaged Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., to draw plans for extensions and improvements in municipal electric light and power plant, to include installation of 5000-kw. turbo-generator, boilers and auxiliary equipment. Cost about $250,000.

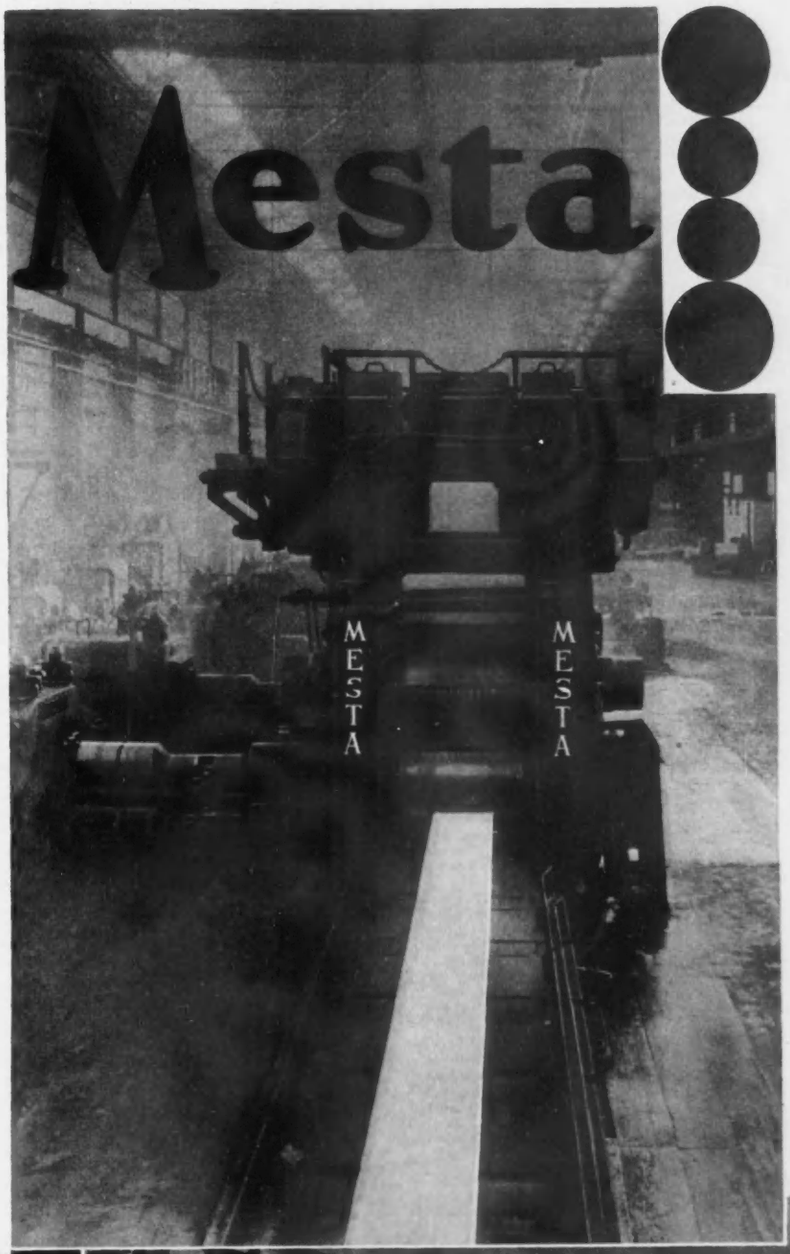
Duluth Marine Supply Co., Fifth Avenue West and Bayfront, Duluth, Minn., has leased building at First Avenue East and Superior Street, now being remodeled, for new plant.

B. A. Railton Co., 363 West Erie Street, Chicago, wholesale grocer, has plans for four-story and basement storage and distributing plant, with foundations for two additional stories later. Cost over $500,000 with mechanical-handling and other equipment. S. N. Crowen & Associates, 228 North La Salle Street, architects.

Iowa Railway & Light Corpn., Cedar Rapids, Iowa, is considering extensions and improvements in plants and system, including transmission lines, near Boone, Iowa. Cost over $150,000 with equipment.

Standard Silica Co., Ottawa, Ill., has begun erection of new mechanical drying plant to replace unit destroyed by fire. Cost close to $100,000 with machinery.

Wabash Railroad Co., St. Louis, has reopened locomotive shops at Decatur, Ill., fol-



4 HIGH CONTINUOUS HOT STRIP MILLS

are designed and built complete, with auxiliary equipment, by MESTA in the largest unit plant in the world producing rolling mill equipment.

These mills roll strip steel of uniform gauge and finest quality, at high speed, resulting in large tonnage and low operating costs.

MESTA MACHINE CO.
PITTSBURGH, PA

lowing curtailment for several months, giving employment to about 1100 men. It is proposed to increase this working force by 1000 additional men within next fortnight, with prospects of further increase before summer.

Pioneer Gravel Equipment Mfg. Co., Central Avenue, Minneapolis, manufacturer of sand and gravel equipment, has arranged with Waterous, Ltd., Brantford, Ont., to occupy portion of that plant for machinery manufacture for Canadian trade.

BUFFALO

Elmira Water, Light & Railroad Co., Elmira, N. Y., plans installation of gas distributing system in Big Flats district, Chemung County.

H. H. Franklin Mfg. Co., 302 South Geddes Street, Syracuse, N. Y., manufacturer of Franklin automobiles, has begun production of bodies for new 12-cylinder automobiles and will double output in April.

J. A. Taylor, Inc., Buffalo, has been organized by John A. Taylor, 1088 Fillmore Avenue and Martin A. Aschenbrenner, same address, to manufacture bakers' machinery and equipment.

Fairport Municipal Commission, Fairport, N. Y., has applied for permission to install an electrical distribution system at Perinton, N. Y., and vicinity.

CINCINNATI

Construction Quartermaster, Wright Field, Dayton, Ohio, will be in charge of expansion program at Fairfield Air Depot, Fairfield, Ohio, including hangars with repair shops, operators' building, central steam power house and other units. Cost about $236,000, and gasoline storage and distributing system, $10,000.

Dan Shea Boiler Works, 1106 Kansas Street, Memphis, Tenn., plans rebuilding part of plant recently destroyed by fire. Loss over $55,000 with equipment.

Jordan Mfg. Co., Johnson City, Tenn., manufacturer of textile mill equipment and supplies, has resumed operations following curtailment for nearly a year.

Automatic Specialties Co., Dayton, Ohio, has been organized by Alfred J. and William A. Selz, 418 East First Street, to manufacture mechanical equipment, parts, etc.

Frigidaire Corpn., Dayton, Ohio, has established production schedule of 7000 electric refrigerators daily, with assembling line operating seven hours a day, six days a week. Increased production is planned during next 30 to 60 days, with addition in working force.

Department of State Aeronautics, Nashville, Tenn., R. S. Boutelle, director, is considering establishment of State-aid municipal airports with hangars, repair shops and other field units at Athens and Tipponville, Tenn.

ST. LOUIS

Phillips Petroleum Co., Bartlesville, Okla., let general contract to Austin Co., 510 North Dearborn Street, Chicago, for bulk oil storage and distributing plant at Niles Center, Ill. Cost about $100,000 with equipment.

State Board of Affairs, W. C. Hughes, chairman, State Capital Building, Oklahoma City, Okla., plans one and two-story power house at State penitentiary, Stringtown, Okla., including installation of three boilers, three generators and auxiliary equipment. Ice plant and one-story machine shop, also are planned. Layton, Hicks & Forsyth, Braniff Building, Oklahoma City, are architects.

Water Department, Oklahoma City, Okla., Thomas G. Banks, superintendent, plans installation of tanks and other equipment in connection with waterworks expansion and improvement program; bids to be asked on general contract in 30 to 60 days.

City Foundry Co., Ninth Street and Park Avenue, St. Louis, plans rebuilding part of foundry recently destroyed by fire. Loss over $45,000 with equipment.

Missouri-Kansas-Texas Railway Co., St. Louis, has increased operations for repair and reconditioning of rolling stock at different locomotive and car shops on lines, recalling about 1000 men.

Missouri Pacific Railroad Co., Railway Exchange Building, St. Louis, has plans for superstructure for eight-story grain elevator at Kansas City, Mo. Cost about $150,000 with equipment. It will be operated by Hall-Baker Grain Co., Board of Trade Building, Kansas City, replacing unit recently destroyed by fire. E. M. Tucker, Railway Exchange Building, company engineer.

Public Service Co. of Oklahoma, Tulsa, authorized increase in capital from $30,000,000 to $46,000,000, part of proceeds to be used for expansion and improvements in properties.

City Council, Steelville, Mo., plans installation of 75,000-gal. steel tank on 125-ft. tower in connection with extensions and improvements in municipal waterworks. Bond issue of $75,000 for program. J. W. Shikles & Co., New York Life Building, Kansas City, Mo., consulting engineers.

Kansas City Battery & Mfg. Co., Kansas City, Mo., has been organized by J. H. Levin, 5628 Kenwood Street, and associates to manufacture electric storage battery equipment and kindred electrical products.

DETROIT

Zouri Drawn Metals Co., Chicago Heights, Ill., manufacturer of metal store fronts, doors, windows, etc., has arranged for early removal of plant to Niles, Mich., and will occupy part of factory of Kawneer Co., manufacturer of bronze doors, store fronts, etc., with which Zouri company is affiliated.

Constructing Quartermaster, Selfridge Field, Mich., asks bids until April 20 for erection of forge and wheelwright shop at Wayne, Mich. (Circular 22).

Knight Screw Products Co., Detroit, has been organized with capital of $50,000 to take over and expand company of same name at 6510 Epworth Boulevard, manufacturer of screw machine products. William C. Knight heads new company.

General Motors Corpn., General Motors Building, Detroit, is negotiating for purchase of Packard Electric Co., Warren, Ohio, manufacturer of automotive cables and other wire products, including aviation wire. Packard company operates a subsidiary at Toronto, as Packard Cable Co. of Canada, Ltd.

Panyard Piston Ring Co., Muskegon, Mich., is advancing production to a full time 50-hr. week schedule, following operations on half-time basis.

Jackson Machine Tool Co., Detroit, has been organized to take over and succeed to company of same name at 3508 St. Aubin Street, manufacturer of machine tools and equipment. Harold E. Jackson heads new company.

MILWAUKEE

Wisconsin State Board of Health, Madison, has issued orders to city of Beloit, Wis., to proceed immediately with plans for municipal sewage disposal plant and file plans not later than July 1. Cost upward of $125,000. H. G. Otis is city manager.

Utility Supply Co., subsidiary of Four Wheel Drive Auto Co., Clintonville, Wis., has received contract from Western Electric Co., Chicago, to supply needs of entire Bell telephone system in various types of motor truck derricks. Bell system, it is stated, operates more than 10,000 trucks.

City of Iron River, Mich., is holding special election April 5 on question of $75,000 bond issue for establishment of municipal light and power plant. Norris Dunk is city clerk.

Bahr Construction Co., Manitowoc, Wis., is successful bidder for construction of new municipal waterworks and sewerage systems for village of Cedar Grove, Wis. Project will cost about $75,000.

INDIANA

Board of Public Works, Fort Wayne, asks bids until April 12 for equipment for municipal electric light and power plant, including coal elevating and distributing system, shuttle belt conveyor, coal track hopper, three automatic scales, three segregating spreaders, traveling coal crusher, one 10-ton motor-driven lorry, soot and ash-handling system, etc. Program cost $60,000. Froehlich & Emory, Toledo Trust Building, Toledo, Ohio, consulting engineers.

Public Service Co. of Indiana, Indianapolis, has arranged for a bond issue of $7,500,000, part of proceeds to be used for extensions and improvements in properties.

Hicks Body Co., Inc., Lebanon, has been organized by Earl M. and William T. Hicks, Lebanon, to manufacture automobile bodies; motorboat repair plant will also be operated.

Board of Trustees, Purdue University, West Lafayette, asks bids on general contract until April 5 for second unit of new mechanical engineering school, three-stories and basement, 60 x 230 ft. Cost about $200,000 with equipment. Walter Scholer, Wallace Building, Lafayette, is architect.

Peter Eckrich & Sons, Inc., 645 Second Street, Kalamazoo, Mich., meat packer, has plans for one-story and basement plant, 150 x 200 ft., at Fort Wayne. Cost about $45,000 with equipment. Louis A. Kingscott, 204 Elm Street, Kalamazoo, architect and engineer.

Crawford & McCrimmon Foundry & Machine Works, Brazil, suffered a loss by fire recently of its entire pattern department. Plant has been closed for some time on account of business conditions.

PACIFIC COAST

Southern California Edison Co., Los Angeles, has disposed of bond issue of $10,000,000, part of fund to be used for expansion and improvements in properties.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until April 27 for one and two-story industrial buildings at naval air station, Sunnyvale, Cal., including crane shed and shop unit (Specification 6791); until April 13 for underground electric distributing system at same station, including equipment (Specification 6813). Bids will be asked soon for water supply system at West Loch, T. H., to cost $45,000 (Specification 6746), plans at office of commandant, Twelfth Naval District, 100 Harrison Street, San Francisco.

Murtaugh Irrigation District, Twin Falls, Idaho, H. T. Henderson, chief engineer, is considering erection of hydroelectric generating plant at Augur Falls, Snake River, in connection with proposed irrigation system in part of Twin Falls and adjoining counties; entire project to cost over $2,000,000 with equipment.

Washington Iron Works, Airport Way, Seattle, plans rebuilding part of plant recently destroyed by fire. Loss over $70,000 with equipment.

Whepley Oil Co., Fresno, Cal., care of A. M. Drew, Coalinga, Cal., representative, is considering new oil refinery near Fresno. Cost over $90,000 with machinery.

Champion Aircraft Corpn., Alhambra, Cal., care of V. A. Morgan, 217 Edison Building, has been organized by M. G. Tetterington and N. C. Howlett, Alhambra, capital $50,000, to manufacture airplanes and parts.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 12 for three lathe chucks (Schedule 7751) for San Diego Navy Yard; valve equipment, relays, spare parts, etc. (Schedule 7749) for Mare Island Navy Yard; until April 19 for three motors for hydraulic speed gears, three controllers and spare parts (Schedule 7750) for Mare Island.

United States Department of Agriculture, Washington, M. C. Betts, architect, will soon ask bids for new service base for Forestry Department on Government Island, Alameda, Cal., to include mechanical shop, storage and distributing unit, automobile service, repair and garage building, and other structures. Entire cost about $650,000.

California Aircraft Repair Co., 9401 South Western Avenue, Los Angeles, has been organized by E. C. Genereaux, Jr., 945 Wilshire Boulevard, and associates, to operate airplane repair and parts plant.

Hollup Corpn., manufacturer of welding wire and equipment, 3333 West Forty-eighth Place, Chicago, has opened a branch factory at 5701 Green Street, Emeryville, Cal., and will begin operations April 1.

CANADA

Long Mfg. Co., Detroit, has secured floor space in East Windsor, and is installing equipment for manufacture of automobile equipment, including radiators, clutches, etc.

Essex Wire Corpn., Detroit, has leased factory space at Windsor, Ont., and is installing machinery for production of insulated wire. L. C. Lookout will be manager.

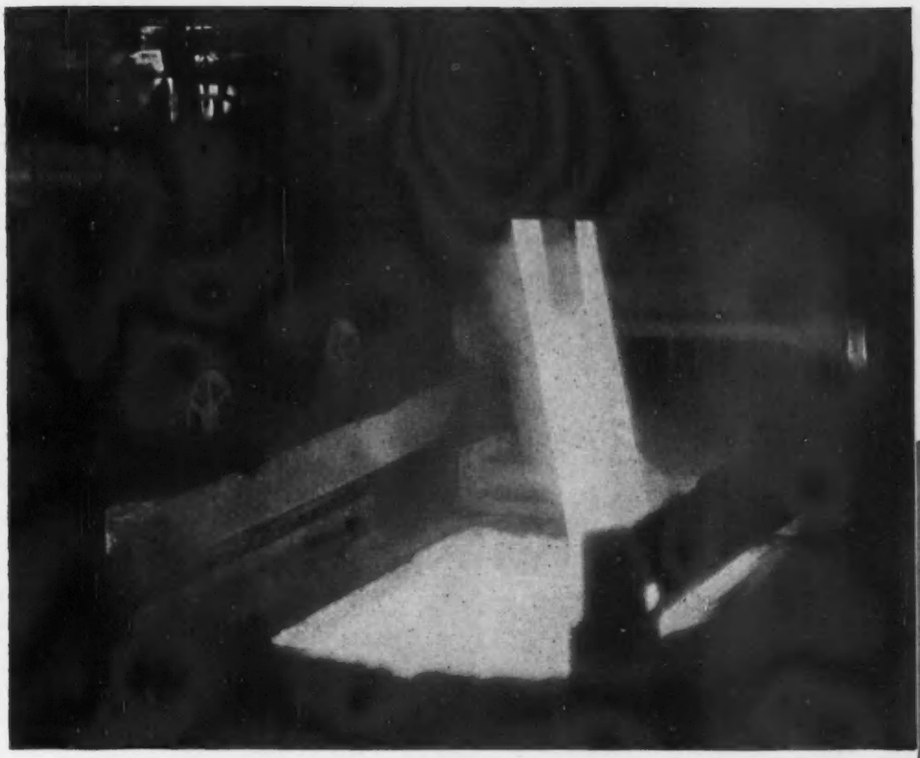
Ohio Truss Co. of Canada, Ltd., subsidiary of Ohio Truss Co., Cincinnati, has secured premises on Sandwich Street, Windsor, Ont., for the production of its commodities for Canadian trade and export to British possessions.

Nielco System, Inc., Detroit, is arranging for incorporation in Ontario, and will establish a plant at Sarnia, Ont., for manufacture of machinery for washing interior and exterior of houses, boats, etc.

A. B. Dick Co., Chicago, has secured premises at 179 John Street, Toronto, for manufacture of duplicating machines and allied products, etc. It is planned to incorporate a Canadian subsidiary, to be known as Mimeograph Co., Ltd.

Town Council, St. Cesaire, Que., will enlarge waterworks plant at cost of $25,000 and is in market for centrifugal pump. Fabius Ruel, 757 Place D'Armes, Montreal, is engineer.

INTO THE SOAKING PIT

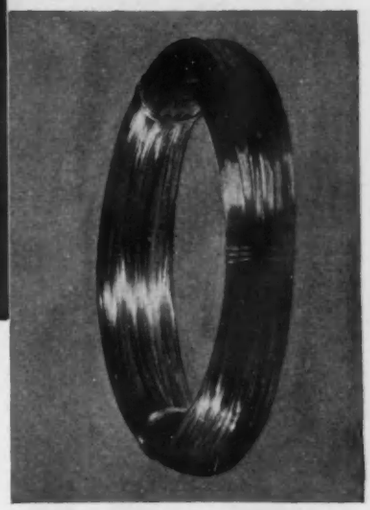


There the ingot must remain until the molten center cools and the metal comes to a uniform temperature ... then it is rolled into billets ... billets in turn rolled into rods ... rods drawn into wire ... all in the Wickwire Spencer Mills under one control ... under one management. Wissco Wire, exclusively the product of the Wickwire Spencer Steel Company, is of the highest quality in its every type and kind. Its uniformity has long been proverbial in wire working industries.

Wickwire Spencer Steel Co., 41 East 42nd Street, New York City

Buffalo, Chicago, Detroit, Philadelphia, Tulsa, Worcester; *Pacific Coast Headquarters:* San Francisco; *Branches and Warehouses:* Los Angeles, Portland, Seattle. *Export Sales Department:* New York City

WICKWIRE SPENCER



WISSCO WIRE

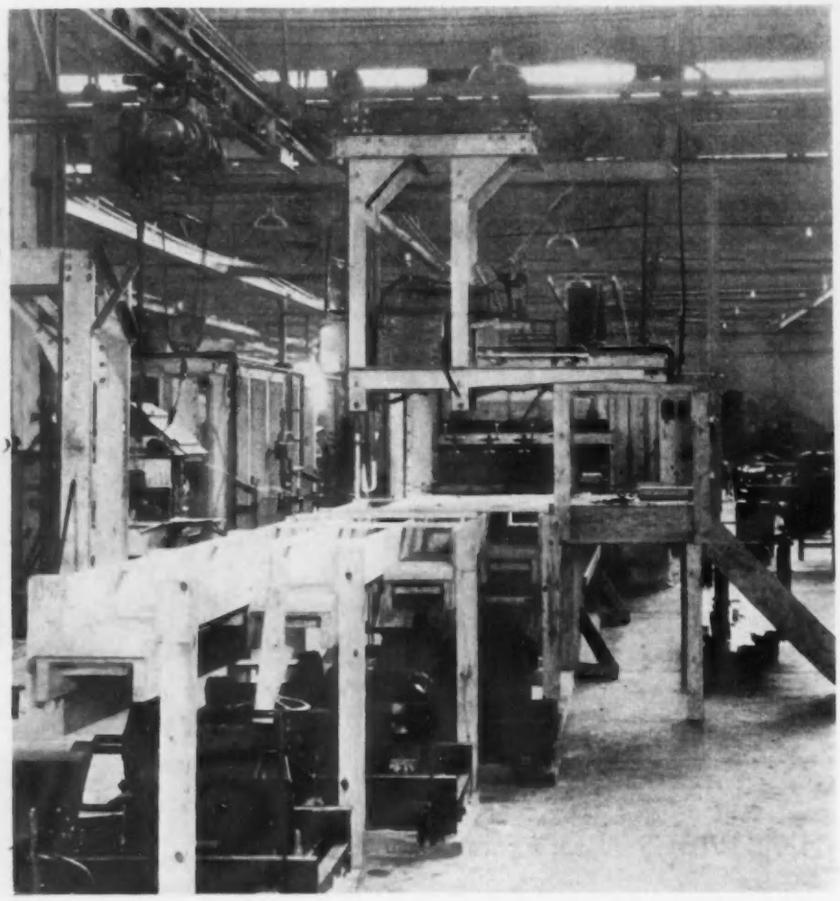
Wickwire Spencer manufactures High and Low Carbon Wires—in various tempers, grades and finishes — for your specific purpose. Hard-Drawn, soft, or annealed Basic or Bessemer Wires — Hard-Drawn annealed, or oil-tempered Spring Wire, Chrome Vanadium Spring Wires — Valve Spring — Music — Clip — Pin — Hairpin — Hook and Eye — Broom — Stapling — Bookbinding — Machinery Spring Wire — Reed Wire — Clock — Pinion — Needle-Bar — Screw Stock — Armature Binding — Brush — Card — Florist — Mattress — Shaped — Rope — Welding. Flat Wire and Strip Steel, High or Low Carbon — Hard, annealed or tempered — Clock Spring Steel — Corrosion and Heat Resisting Wires. Consult the Wissco technical man on your wire problems, however large or small.

Wissco Wire *by Wickwire Spencer*

Cold Rolling Stainless Strip Steel

(*Continued from page* 779)

tinuous furnace 30 ft. long with a hearth 48 in. wide. The coils are placed in a coil box by the same handling equipment and fed through a roller leveler to the furnace. Two strips move through the furnace at a time, side by side. The strip is drawn through the furnace by 20-in. reels on which it is wound and moves at a speed of 5½ ft. to 6 ft. per min. After the end of a strip is pulled through the furnace with a threader it passes into a set of pinch rolls which move it forward until it is wound around the reel. Then the pinch rolls are opened. The ends of two pieces of strip are coupled together with a rivet. Back of the discharge end of the furnace is a 53-in. motor operated Dries & Krump 2-knife shear with which the ends of the joined pieces of strip are cut off on each side of the rivet.



Strip is guided from pay-off reels into the annealing furnaces through wooden runways. Overhead is shown a movable electric welder for welding the ends of pieces of strip. Loading end of one of the furnaces is shown in the background.

An electric hoist swings over the two reels at the discharge end of the furnace on a quadrant type jib crane permitting it to be spotted over either reel. This jib crane connects with a tramrail line that extends across the building to the coil pickling department to which the hoist carries the coils.

The coil pickling room is equipped with four wooden tanks 33 x 108 in., three for pickling and one a hot water rinsing tank. Adjoining the latter is a small tank of steel construction over which a small stream of water at high pressure is played to remove the loose scale.

The cleaning and pickling tanks are served by two parallel monorails connected together at both ends by sliding switches and also connected at one end to the track on which the coils are carried from the normalizing furnace. The parallel monorails permit the pickling of two coils at a time. The electric hoists that operate on these tracks above the pickling tanks have rigid arms for hand pushing, the arms being side extended to clear the pickling tanks, and push button hoist control located at the end of the arms. The coils are handled flatwise on a special three-arm carrier through the center of which slides a vertical steel rod by which the load is picked up by the hoist. In setting the loads down after pickling the three arms drop through clearing slots in a bench or roller conveyor section. The center rod also drops down into an arm hub permitting the coil to slide or roll sideways to a point where it can be picked up by the next handling unit. The steel is kept in the pickling solution six to ten minutes.

The coils move in a straight line from the pickling room to the mill, being picked up at the end of the cleaning tanks by electric hoist on a hand pushed crane that has a track extending from the pickling department to the first mill stand.

A specially designed polishing machine for removing any scale that may still be left on the steel is located at the side of the crane runway. However, much of the steel is sufficiently free of scale to make the additional cleaning operation unnecessary. This polishing machine consists of a series of 10 air operated clamps, eight covered with emery of any grit desired and the last two used as wipers, that are mounted above a table over which the strip moves. The strip is drawn through this machine by a reel at one end while the cleaning surfaces of the clamps are held tight against the surface of the steel with an air pressure of 15 to 20 lb. Any scale that may have been left on the surface after pickling is removed by this polishing operation and the steel comes out of the machine with a bright clean surface.

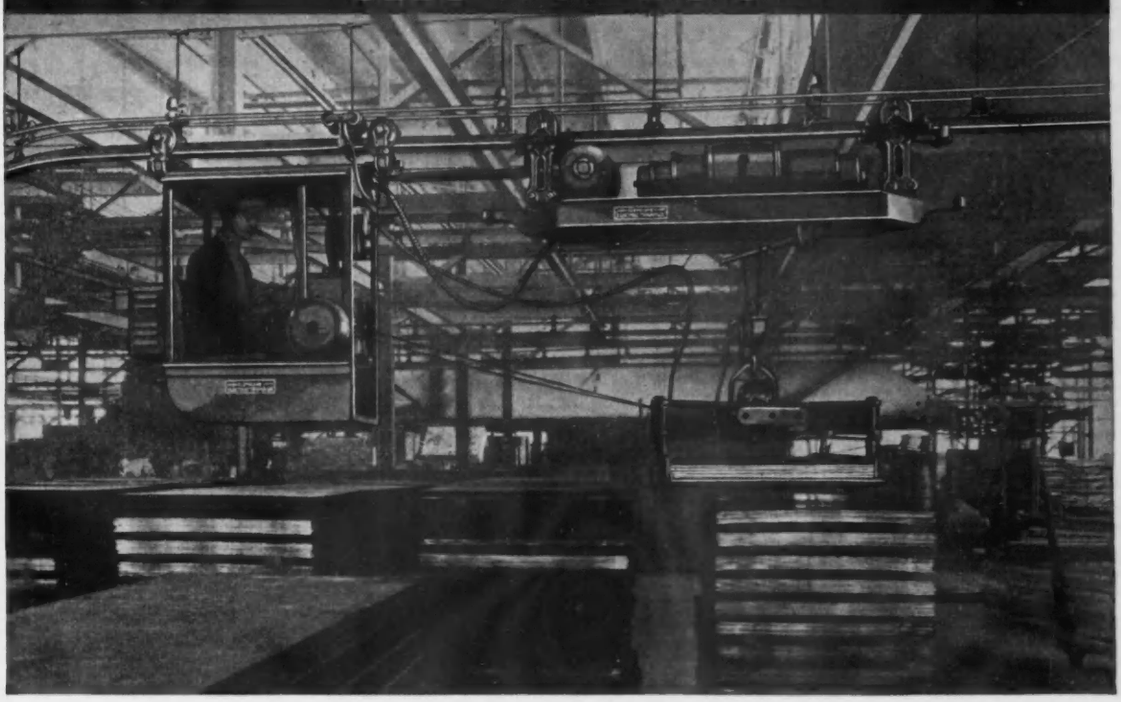
After cleaning, the overhead crane carries the strip to the mill and after rolling the spooled or coiled material is trucked to the furnaces for intermediate annealing. Some of the strip in the lightest gages makes three circuits through the furnaces, pickling tanks and mill stands.

The heavier strip comprising over 60 per cent of the output, after being given its reduction is annealed in the furnace previously referred to, that is also used for normalizing. However, there are two additional similar continuous furnaces but smaller, these being 18 ft. long and 50 in. wide. These as well as the larger furnace have Leeds & Northrup temperature recording instruments, the temperature being taken at each end of the furnace. All the furnaces were designed and built by the Republic Steel Corpn.

Strip is fed into the smaller fur-

(*Concluded on advertising page* 30)

HAS A TRAMRAIL MAN SHOWN YOU



How Tramrail equipment has proven, by years of operation, its ability to stand up under the most severe and exacting service

Has he shown you how, by the proper layout and use of Cleveland Tramrail, material can be piled to the limit of the carrying capacity of the floor. Every point of the warehouse is readily accessible - stock can be removed from the warehouse and deposited at the production tools - Without Rehandling.

CLEVELAND ELECTRIC TRAMRAIL

Division of

THE CLEVELAND CRANE & ENGINEERING CO.

WICKLIFFE OHIO

There is a Thoroughly Trained Tramrail Engineer within a Short Distance from Your Door

There may be Real Advantages in making use of his services which are offered without obligation

Akron, Ohio
Albany, N. Y.
Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boston, Mass.
Brooklyn, N. Y.
Buffalo, N.Y.
Camden, N. J. (See Trenton)
Charleston, W. Va
Charlotte, N. C.
Chattanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Dallas, Tex.
Davenport, Iowa
Dayton, Ohio
Detroit, Mich.
Duluth, Minn.
Easton, Pa.
East St. Louis, Ill.
Elizabeth, N. J.
Erie, Pa.
Evansville, Ind.
Fort Wayne, Ind. (See Toledo)
Hagerstown, Md.
Indianapolis, Ind.
Johnstown, Pa.
Joliet, Ill. (See Rockford)
Kansas City, Mo.
Knoxville, Tenn.
Los Angeles, Calif.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Mobile, Ala.
Muskegon, Mich.
Nashville, Tenn.
Newark, N. J.
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Nutley, N. J.
Peoria, Ill.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Oregon
Providence, R. I
Richmond, Va.
Rochester, N. Y.
Rockford, Ill.
San Francisco, Calif.
Seattle, Wash.
Sheboygan, Wis.
South Bend, Ind.
Springfield, Mass. (See New Haven)
St. Louis, Mo.
Syracuse, N. Y.
Toledo, Ohio
Trenton, N. J.
Tulsa, Okla.
Worcester, Mass.
York, Pa.
Youngstown, Ohio

CLEVELAND

HAND OR ELECTRIC TRAMRAIL

naces from pay-off reels. One of these furnaces is designed to handle at one time four strips 10 in. wide and the other will handle any width. The strip is guided from the reels to the furnace through wooden runways. Ends of the strip are welded together by a Federal electric welder located above the runways and mounted on an overhead short 4-wheel carrier so that it may be moved back and forth to serve any one of the four runways. In an open space between the runways and the furnace entrance is a wooden chute extending several feet below the floor providing space for any slack that may exist in the strip between the runways and the furnace entrance.

A primary consideration in production is the hardness of the product. This is checked by a Rockwell machine located near the furnace operators. Another important consideration is the softening operation. This is conducted at high temperatures which are under exacting control. Otherwise, the strip surface might be sufficiently damaged to become unfit for the pickling operation.

Annealing is performed in Carborundum muffle furnaces. No flame comes in direct contact here with the strip. Heat in the furnaces is supplied by natural gas and is so controlled that the atmosphere within the muffle produces definite characteristics of scaling. The pickling operation, which follows the annealing, is continuous. It is handled in direct connection with the speed of the annealing. The solution rate time for different thicknesses of strip presents a complex problem, requiring as it does equipment that will develop the highest possible precision of operation and control. Inasmuch as pickling must be done in connection with annealing and at annealing speed, the several operations must be so flexible and so well controlled that it is possible to clean all widths and thicknesses of strip. This is effected by variation of the immersion time, by control of the pickling solution and of the temperature at which the pickling bath is handled. The pickling acids also demand close attention by reason of their highly corrosive action. Nitric and hydrofluoric acids, rather than the conventional sulphuric and muriatic acids, are employed, owing to the difference in the problem encountered.

The pickling is done in two continuous pickling machines with tanks 25 ft. in length. These are in straight line with the two annealing furnaces from which the strip passes directly to the pickling tanks in the sequence of continuous operation. Leaving the pickling tanks the strip is rinsed and cleaned in a mechanical scrubber and then passes through a drying machine. If it is to be given further mill reductions it is coiled on spools on reels which have drawn the strip from the pay-off reels beyond the loading end of the furnaces and on through the furnaces and cleaning equipment. Shears are located beyond the drying equipment for cutting finished strip, these having a capacity for cutting four strips at a time.

This finished material after shearing goes to the final finishing operations. Electric hoists are provided for handling coils and spools at the pay-off reels and at the reels at the end of the cleaning equipment. When slitting is required, this is done on a Yoder Co. slitter. The scrap from the slitter is baled in bundles which are limited to 12 in. diameter or a size convenient for charging in an induction electric furnace. Final polishing of the strip, if required, is usually done after slitting.

The tramrail, crane and electric hoist equipment was supplied by the Cleveland Crane & Engineering Co.

Each mill stand is driven by a 300-hp., 230-volt, 400 to 1200-r.p.m. motor. Energy is supplied by two 500-kw. Allis-Chalmers motor generator sets. The motors, except the reel motor, and the exciter sets and control were supplied by the Westinghouse Electric & Mfg. Co.

The two generators are so arranged that they can be operated either singly or in parallel for tandem operation. The generator bus is split so that the motors on the first two stands are connected to the first generator section of the bus and the third stand and the reel is connected to the second generator section of the bus. The coiler motor can be transferred to either section of the bus depending on whether it is following stand two or stand three.

With this connection the whole mill can be operated in tandem with tie breaker closed using either the reel or the coiler to coil the strip as it leaves stand No. 3. When the tie breaker is opened the first two stands can be operated together and the strip coiled on the coiler as it leaves stand No. 2. At the same time the third stand can be operated and the strip coiled on the reel.

When operating in tandem the strip can be rolled with tension between stands and using the reel it can be coiled under tension. Tension can also be maintained between stand No. 1 and No. 2 and between the reel and stand No. 3 when the two sections of the mill are operating independently.

Tension between stands is regulated and maintained by using series exciters which excite a combination of differential and cumulative variable potential fields on the motors.

Tension between stand No. 3 and the reel is obtained by the use of constant current regulator on the reel motor.

The mill is started by variable voltage and the speed of each stand is adjusted by the use of hand operated rheostats in the shunt field of the motors.

The "threading in" speed and the running speed of the mill are independently adjustable.

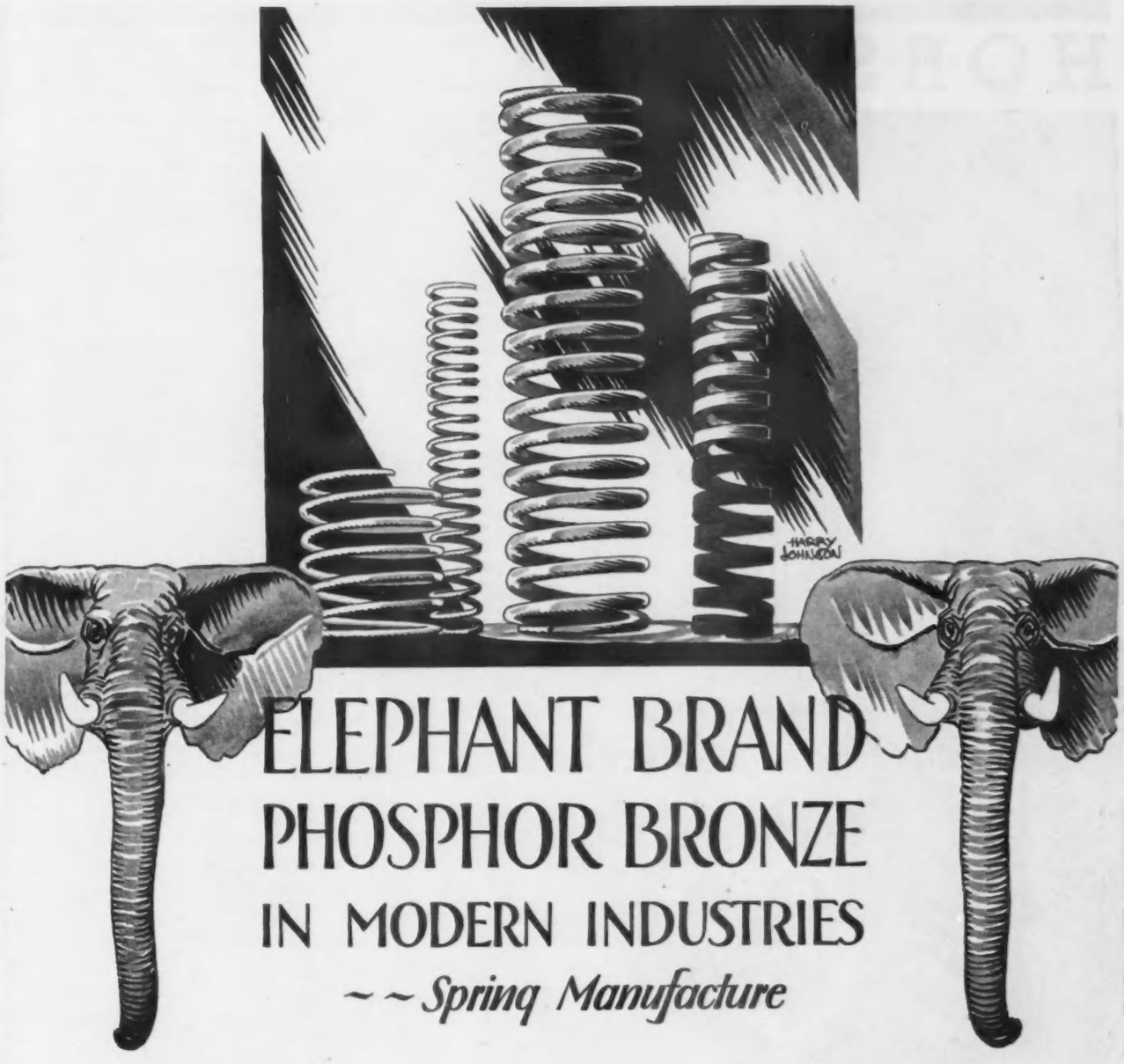
Study of the new cold rolled stainless strip plant can hardly fail to suggest that a good product rather than tonnage production is the primary goal aimed at by Republic's management. The value of the product involved is so high, as compared with ordinary steels, that variation from such a policy would be almost certain to result disastrously.

Customs Court Decides on Woven Wire Duty

The United States Customs Court, Second Division, in New York, last week handed down an important decision affecting the duty on woven wire. The case was brought into court by Sears, Roebuck & Co., Chicago, who objected to a payment of a duty of 50 per cent on wire fencing galvanized before weaving and of 60 per cent on such fencing galvanized after weaving. The court held that the shipment was dutiable at 45 per cent ad valorem in accordance with paragraph 397 of the tariff law.

A particular feature of the court's decision involved a constitutional question as to the scope of the flexible provision of the tariff law which authorizes the President to increase duties not to exceed 50 per cent. In this particular case the court held that President Hoover exceeded his executive powers and encroached upon the legislative rights enjoyed by Congress alone in writing in an entirely new paragraph into the tariff law.

A large quantity of woven wire has recently been coming into this country, particularly on the Pacific Coast, where a considerable portion of the imports has been used in stucco building construction.



ELEPHANT BRAND PHOSPHOR BRONZE IN MODERN INDUSTRIES

~~Spring Manufacture

The ever increasing demand of spring manufacturers for alloys of a fixed standard of uniformity and excellence is fully met by Elephant Brand Phosphor Bronze.

The introduction of phosphorus into its composition reduces any oxides dissolved therein and forms with the purified metal a most homogeneous and regular combination; the hardness, strength, toughness, rigidity, and elasticity being always under control.

These essential factors together with its great corrosion resisting qualities have not only proved its unusual adaptability for a wide variety of springs; but have also established the superiority of Elephant Brand Phosphor Bronze throughout the spring manufacturing industry. Its great elasticity, toughness, and other qualities make it highly preferable in a wide range of application in this field.

Elephant Brand Wire is made in various grades and forms for every requirement. Flat Rolled Spring Wire, Square Wire, Half Round Wire, Straightened Wire, Tinned Binding Wire, Telephone and Telegraph Wire. Special Temper Wire to order. Also Wire Rope.

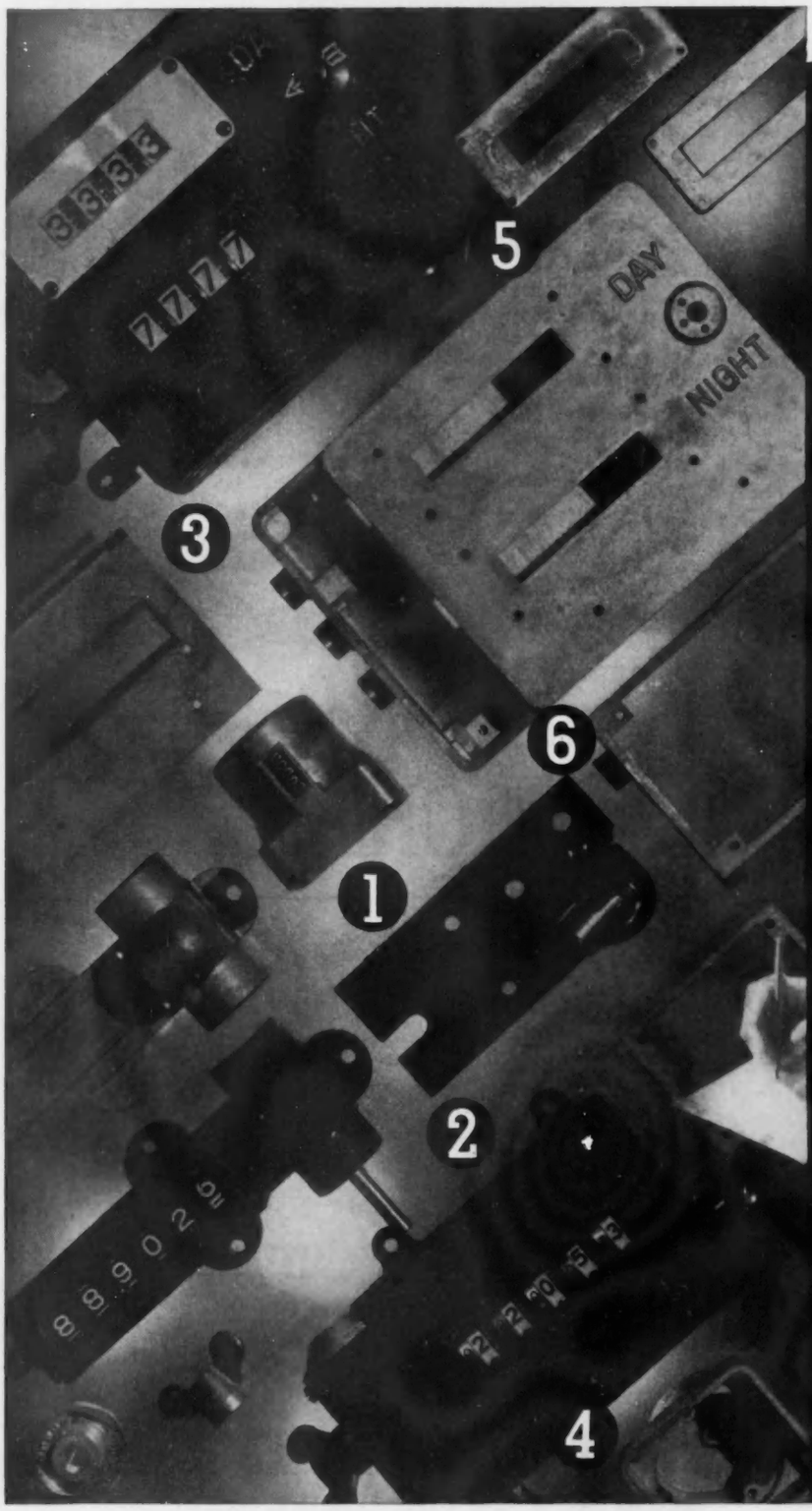
Our latest booklet contains complete information including prices of Elephant Brand products.

THE PHOSPHOR BRONZE SMELTING CO.
2200 WASHINGTON AVENUE **PHILADELPHIA, PA.**
Ingots — Castings — Rods — Wire — Sheets — Ropes — Tubing

HORSE HEAD ZINC

UNIFORM QUALITY

FOR DIE CASTINGS



COUNTER POINTS

1. INTRICATE SHAPES
2. BAKED FINISH
3. INSERTS
4. LESS MACHINING
5. FEWER PARTS
6. HORSE HEAD (99.99+%) ZINC ALLOY

COUNTER PARTS DIE CAST FROM AN ALLOY OF HORSE HEAD ZINC

THE NEW JERSEY ZINC COMPANY

160 FRONT STREET, NEW YORK CITY

ZINC ALLOYS - - ROLLED ZINC - - ZINC PIGMENTS - - SULPHURIC ACID - - SPIEGELEISEN

NOTHING ROLLS LIKE A BALL

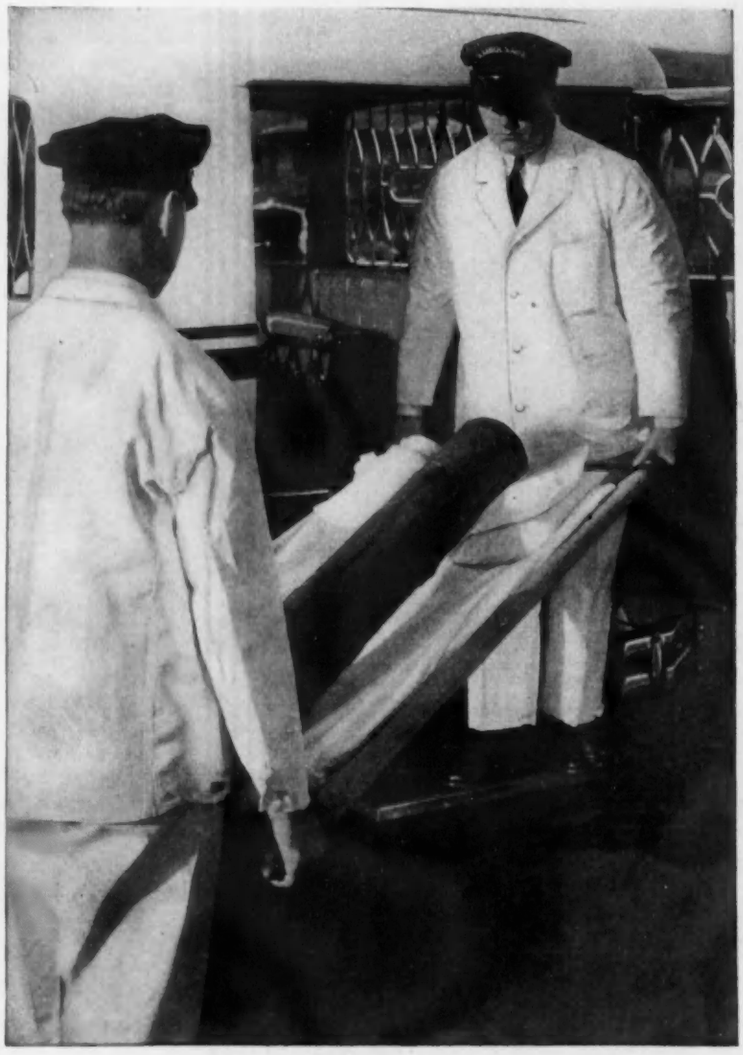
Haskins high speed TAPPING MACHINE has 5 New Departures

Here is a highly developed product . . . built by the R. G. Haskins Co., Chicago. Outstanding features include: a selection of tapping speeds up to 4000 RPM, and bearings able to stand such a pace for many years . . . New Departure Ball Bearings. Haskins chose the grease-packed, enclosed bearings, so that users will seldom need to think of them. Every precaution was taken to eliminate tap breakage, and here again New Departures help because they run so smoothly. New Departures cost a bit more than plain bearings but think of the added life and lessened maintenance costs. It pays to use them generously.

NEW DEPARTURE BALL BEARINGS

Sections of New Departure's N-D-Seal and shielded bearings are shown here Packed with grease and protected from dirt, these enclosed bearings seldom need relubrication.

The New Departure Mfg. Company, Bristol, Connecticut.



BAR YOUR DOORS

AGAINST THE EXPENSE OF "SICK" PIPE

"Sick" pipe — rusty, leaky pipe — is a "patient" that never recovers. Month after month it goes from bad to worse, piling up expenses . . . creating annoying and dangerous emergencies. And when such pipe is finally ripped out in disgust, after a few short years, there is a costly wreck and a brand new installation to pay for!

You pay only ONCE for a Reading Puddled Iron Pipe installation. Then you forget pipe worries—as long as the building lasts! Reading Pipe comes to you without guesswork about its length of life—its endurance has been PROVED through nearly a century of actual service.

Surprisingly, a Reading installation is priced only *slightly* higher than an installation of unsatisfactory pipe. Write us today for information.

READING IRON COMPANY, Philadelphia

READING PIPE
PUDDLED IRON
Since 1836

Science and Invention Have Never Found a Satisfactory Substitute for Genuine Puddled Iron

ARE YOU TAKING ADVANTAGE OF STRIP?

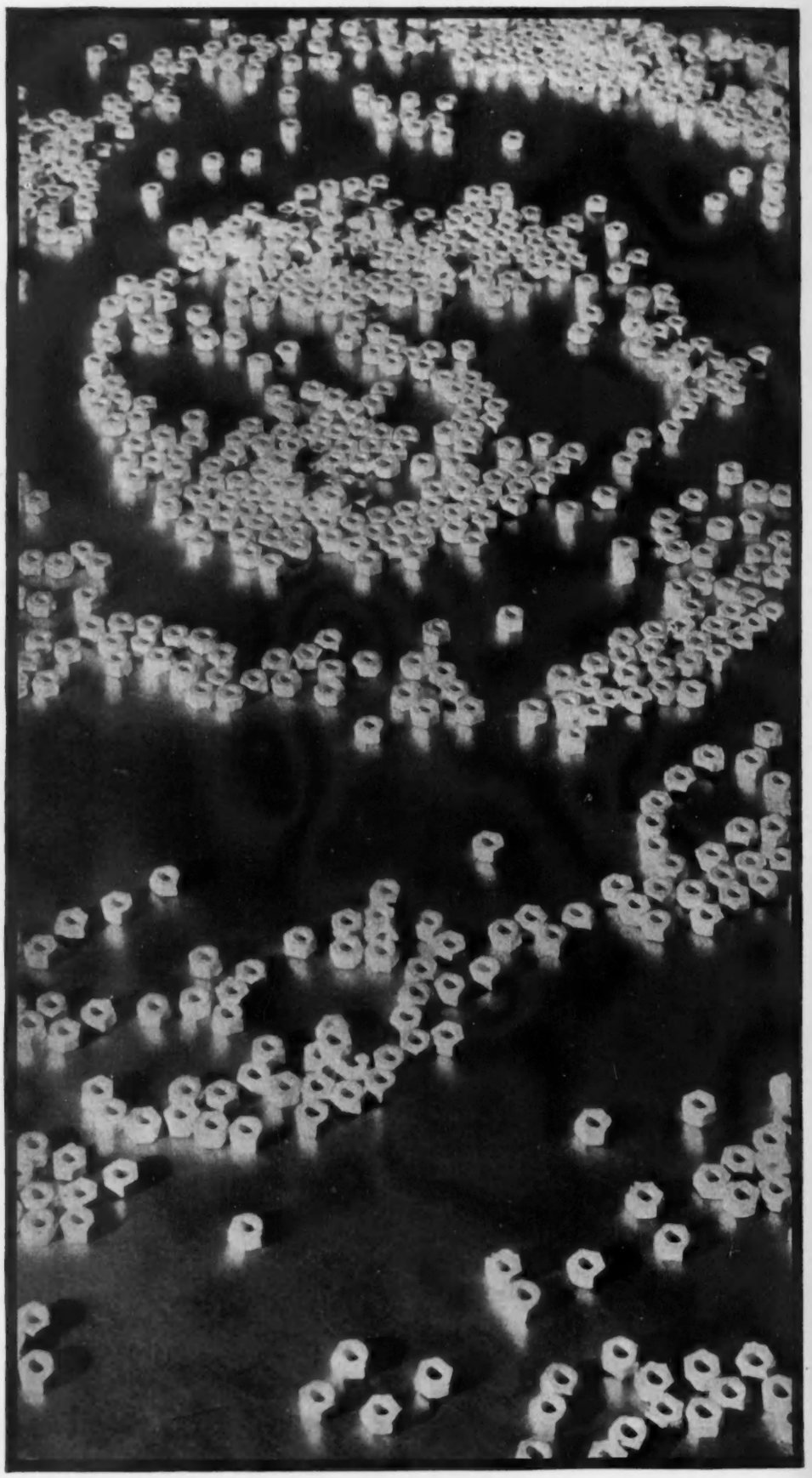
Lower production costs—lower handling costs—more uniform products—increased production from dies—less scrap loss—lower finishing costs—these and many other advantages will accrue to the manufacturer who is willing to spend a little time investigating the possibilities of strip steel.

There's a man in every Republic sales office who will be glad to talk over your problems and make recommendations. If strip steel in any of the many grades and finishes we make fits into your production picture, he will go into the matter with you thoroughly. It's well worth the price of a stamp or telephone call and there's no obligation—just put the burden of proof on Republic.

REPUBLIC STEEL CORPORATION

GENERAL OFFICES YOUNGSTOWN, OHIO

ANSWERING THE



On the opposite page we present another example of how manufacturers are saving money by utilizing the RB&W Engineering Service. This technical counsel is available without obligation.

CRY OF "GET YOUR PRICES DOWN!"

Constructive cost-cutting is a feature of the R B & W Engineering Service

"OH, but we can't change that! We can't cut costs there," expresses the attitude of many minds that fear to do something different when demands are made for cost reduction.

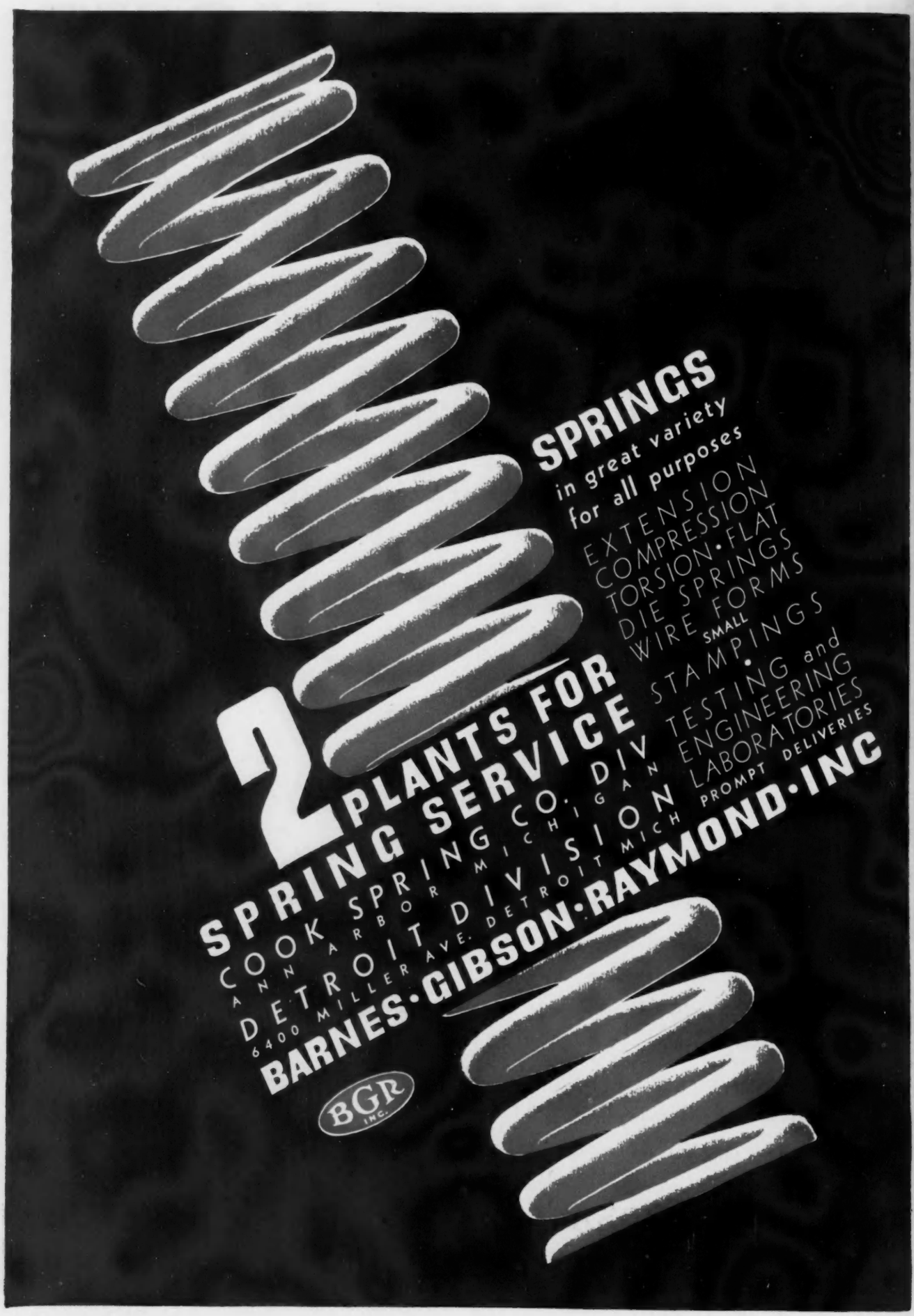
A fresh inquiry into long-established methods very frequently does show that costs can be lowered without impairment of quality or service. And it is just such investigations that have saved the day for many manufacturers recently, and opened new markets for others.

A manufacturer was buying RB&W EMPIRE Bolts with a well-known special finish which enhances the appearance of the bolts... He wrote us, requesting a heavier coating of the special finish, stating that the bolts were not giving satisfactory service, except over a very limited period... We asked him how he used the bolts. When he told us they were used in tanks which he sells to users of a highly-corrosive product, and had to be replaced frequently, we recommended a protective coating which eliminated the difficulty. Since adopting our recommendation he has not had to replace any bolts.

RUSSELL, BURDSALL & WARD BOLT & NUT CO.

ROCK FALLS, ILL. PORT CHESTER, N. Y. CORAOPOLIS, PA.

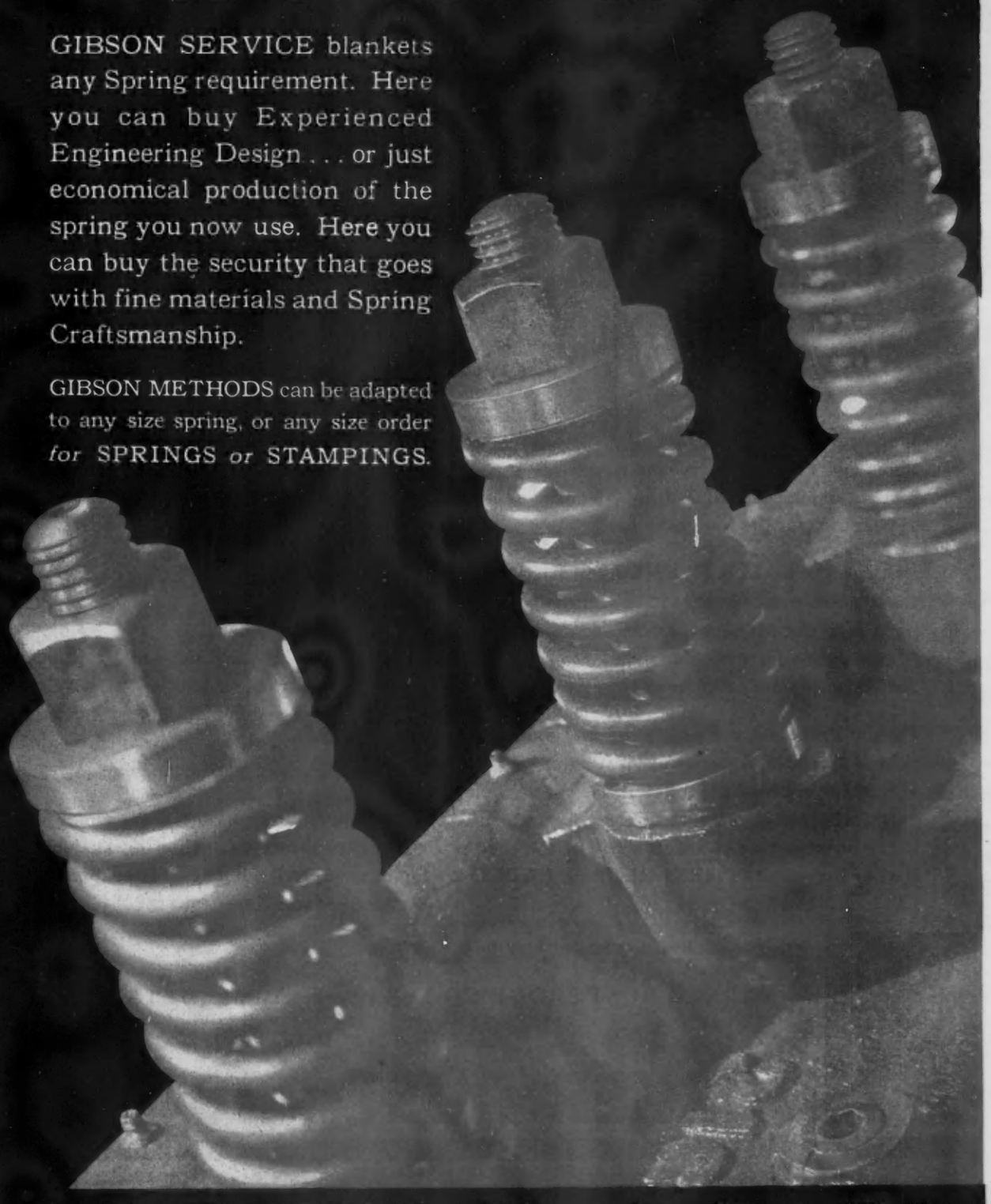
Sales Offices at Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.


SPRINGS
in great variety
for all purposes
EXTENSION
COMPRESSION
TORSION • FLAT
DIE SPRINGS
WIRE FORMS
SMALL
STAMPINGS
TESTING and
ENGINEERING
LABORATORIES
PROMPT DELIVERIES
2 PLANTS FOR
SPRING SERVICE
COOK SPRING CO. DIV
ANN ARBOR MICHIGAN
DETROIT DIVISION
6400 MILLER AVE. DETROIT MICH
BARNES • GIBSON • RAYMOND • INC
BGR
INC.

FROM THE BUYER'S POINT OF VIEW

GIBSON SERVICE blankets any Spring requirement. Here you can buy Experienced Engineering Design . . . or just economical production of the spring you now use. Here you can buy the security that goes with fine materials and Spring Craftsmanship.

GIBSON METHODS can be adapted to any size spring, or any size order *for* SPRINGS *or* STAMPINGS.



WM. D. GIBSON CO., 1800 Clybourn Ave., Chicago, Illinois

New
ALL RUST-PROOFED
DODGE
—
PARKER PROCESSES
protect the Beauty
prolong the Life..

Under the modern beauty of the new Dodge Sixes and Eights *rust-proofing* now gives a permanent union of metal and finish—insuring fine appearance for the life of the car.

"Dodge Dependability" has long insisted upon the rust-proofing of every vital engine and chassis part. *Now this protection, recently made available, is extended to the new Mono-piece bodies, rugged fenders, wire wheels and many other parts.*

Parker Processes are protecting the craftsmanship of many of America's finest cars, by providing a rust-proof phosphate base for the final finish, whether of paint, enamel or lacquer. This is the outstanding characteristic of the three Parker Processes—PARKERIZING, PARCOLITE AND BONDERITE.

BONDERITE not only assures the stability of lustrous enamel and lacquer finishes on automobile fenders, splash guards, wire wheels and head lamp shells, but is also effective on refrigerator cabinets, window screen frames, office equipment and many other articles where rust-proofing and the maintenance of appearance is important.

The phosphate base produced by Bonderizing is made up of millions of minute crystals, forming a cohesive union with the metal and final finish. A small portion of the liquid finish is absorbed when applied and is firmly anchored when dried.

Any manufacturer whose sheet metal products require painting, enameling or lacquering can equip to apply Bonderite. It is adapted to either the large or small user.

The booklet "BONDERITE" *includes full details. Send for a copy today.*

PARKER RUST-PROOF CO., 2186 MILWAUKEE AVE., DETROIT, MICH.

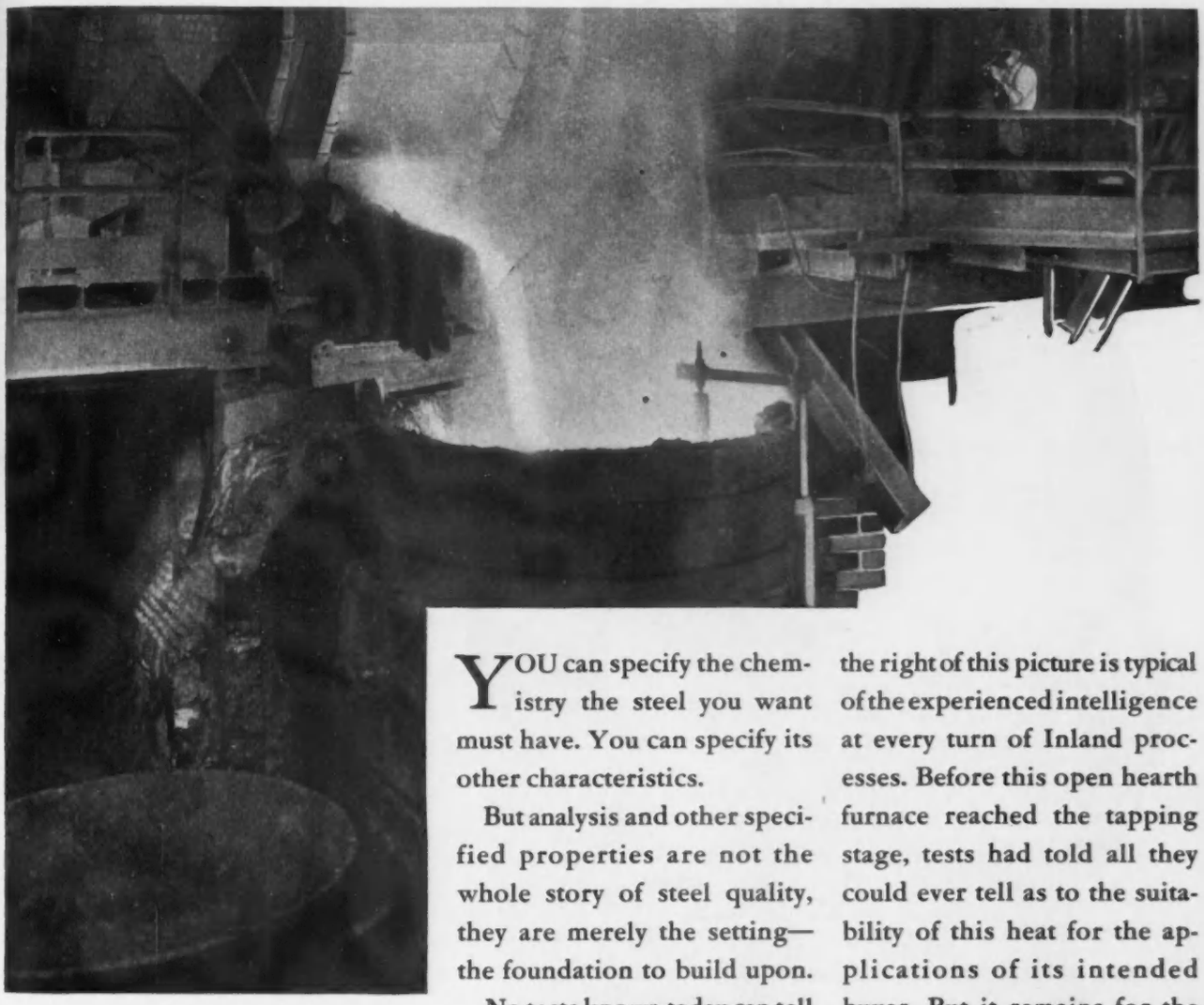
PARKER RUST-PROOFING
SCIENTIFIC RUST PREVENTION

Bonderite — HOLDS PAINT TO STEEL

PARKERIZING IS RUST-PROOFING

PARCOLITE — RUST-PROOFING WITH A SPRAY GUN

HIS PRACTICED EYE PROTECTS YOU WHERE SPECIFICATIONS CANNOT



YOU can specify the chemistry the steel you want must have. You can specify its other characteristics.

But analysis and other specified properties are not the whole story of steel quality, they are merely the setting—the foundation to build upon.

No tests known today can tell quite all of it either. Quality of steel is still finally determined by the experienced brains of the workmen who make it.

The metallurgist you see at the right of this picture is typical of the experienced intelligence at every turn of Inland processes. Before this open hearth furnace reached the tapping stage, tests had told all they could ever tell as to the suitability of this heat for the applications of its intended buyer. But it remains for the metallurgist's practiced eye finally to judge whether this heat is satisfactory. INLAND STEEL COMPANY, 38 South Dearborn St., Chicago, Ill.

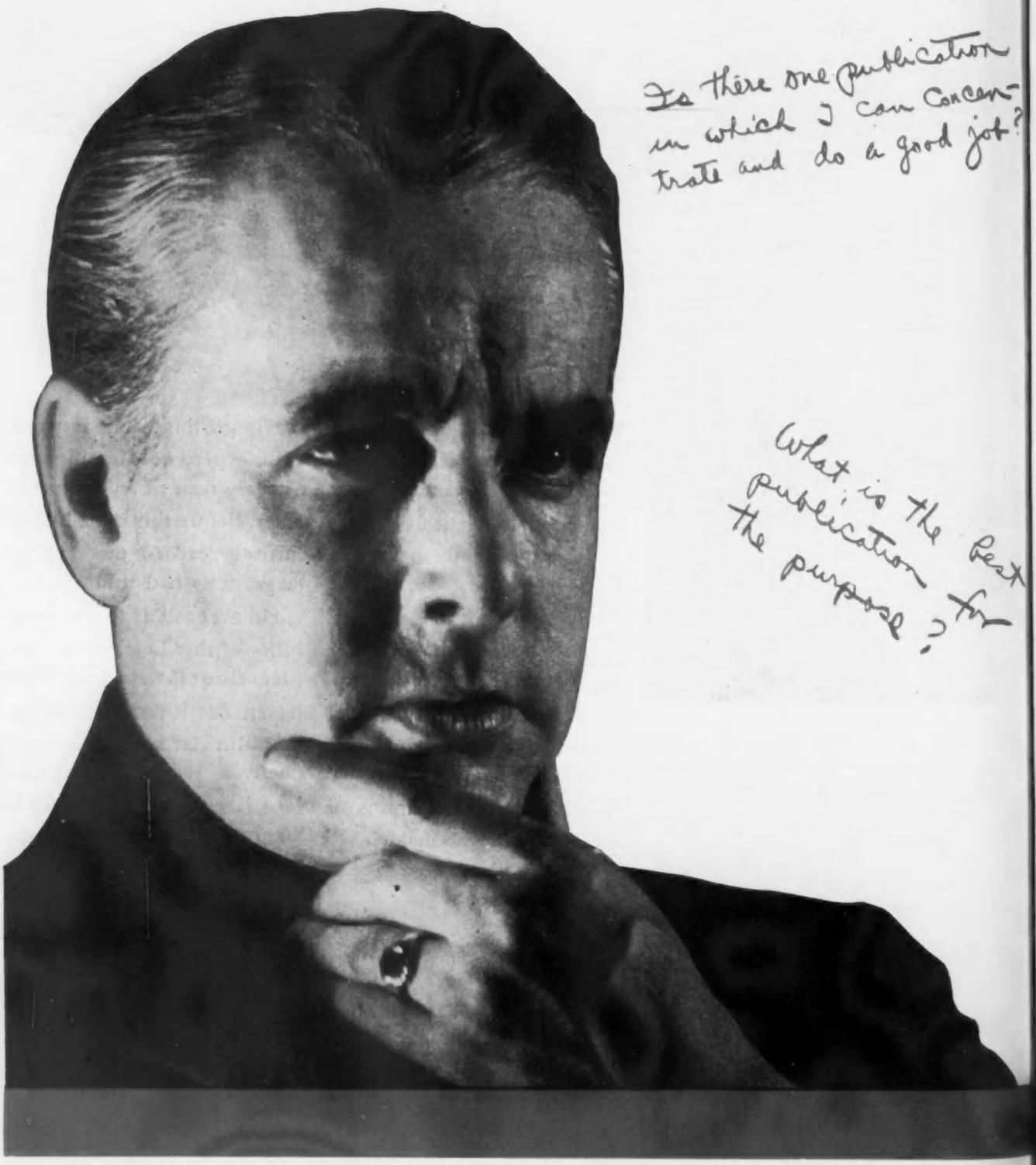
INLAND STEEL

ABLE SERVANT OF THE CENTRAL WEST

Sheets Strip Plates
Bands Structurals Piling

Rails Track Accessories
Bars Rivets Billets

How can I make each 1932 advertising dollar go further?



Is there one publication in which I can concentrate and do a good job?

What is the best publication for the purpose?

To Advertisers with Reduced Appropriations

MOST advertisers today face a common problem. They have less money for sales promotion and advertising, yet their markets need more intensive cultivation than ever before.

Many of these advertisers are now forced to use but one publication in fields where formerly they used several.

Can any one publication alone do a successful job in reaching such a diversified market as the metal-working industry?

Yes. The Iron Age can and does for many an advertiser.

Because The Iron Age singles out no one activity of the industry but covers all. It does not limit its editorial appeal to any one classification, but reports the important activities of the many diversified classifications of the industry.

That is why it is read with equal interest by the manufacturers of automobiles, machinery, electrical equipment, sewing machines and household appliances (to mention but a few of the hundreds of products made by The Iron Age subscribers).

Managerial and production-minded executives—the key men of the industry—read it each week to keep posted on what is latest in equipment, machinery, methods, processes and market news.

These are the men who exercise the last word as to what products shall go into their plants. You can reach these men, more than 49,000 of them, through consistent advertising in The Iron Age.

We have some recently compiled data showing many facts of importance to every advertiser who sells to the metal-working field. We will be glad to send a representative to show you these new facts and figures.

THE IRON AGE

A PUBLICATION OF UNITED BUSINESS PUBLISHERS, INC.

PRODUCTION . . . MANAGEMENT . . . PROCESSES . . . NEWS

Spiral Bevels Have Several Teeth In Contact

Greater tooth contact gives increased strength

Due to the curved and oblique teeth of Spiral Bevel Gears, there is a large area of contact between the gear and pinion. The load, instead of being carried by each tooth individually, is spread over several teeth, increasing the load carrying capacity of the gears and making for quiet, smooth performance, even at extremely high speeds.

In the accompanying illustration, the teeth of the pinion which are in mesh with the gear have been removed and placed in the tooth spaces they would occupy in the gear when properly in mesh.

Spiral Bevel Gears

Spiral Bevel Gears from ⅜″ to 90″ pitch diameter can be cut on Gleason Generators. They are correctly generated by rolling the work with the reciprocating tool or cutter in the same manner that a gear rolls with a crown gear. Gears produced in this way operate quietly and smoothly even at extremely high speeds.

Gleason Generators for Spiral Bevel Gears are built in several sizes and types. Machines from 3″ to 90″ are available for cutting gears on a jobbing basis, while others are designed especially for high production.

Hypoids, which are similar to Spiral Bevels, have the added feature that the pinion is offset from the axis of the gear, allowing the two shafts to pass..

GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Sixty Years

1000 UNIVERSITY AVENUE ROCHESTER, N. Y., U. S. A.

At Your Service

Long years of experience with metal cleaning in all its forms have given the Service Representatives of The J. B. Ford Company unusual ability to be of service wherever a metal cleaning problem exists.

Wyandotte Metal Cleaners are produced to fill every metal cleaning need. They are the result of careful study and analysis over a period of more than thirty years.

The unusual ability of The J. B. Ford Company and its Service Representatives to be of assistance to you is at your disposal.

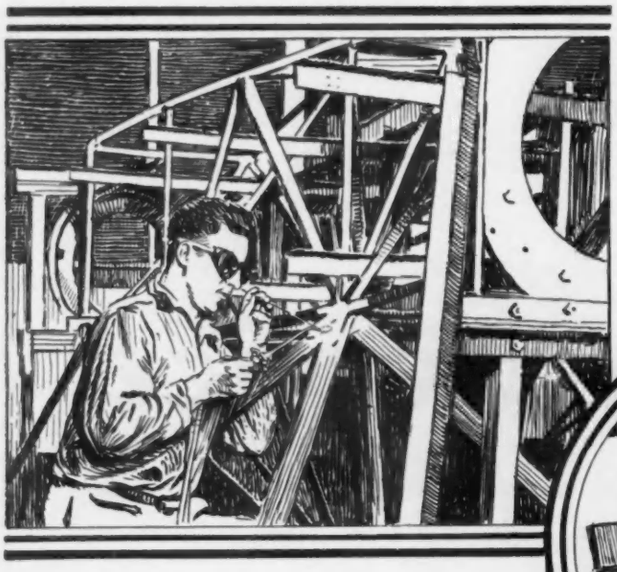
Write for detailed information

THE J. B. FORD COMPANY, WYANDOTTE, MICHIGAN

Wyandotte
Metal Cleaners

From simple joints to complex designs

LINDE PROCESS SERVICE ASSURES DEPENDABLE WELDS



LINDE PROCESS SERVICE frequently suggests methods that mark the turning point from uncertain production costs and possible losses to certain profits.

Whether the problem is one of simple joining or intricate fabrication, Linde Process Service offers you, if you use Linde Oxygen, every facility for the most effective use of oxy-acetylene welding and cutting. This service, with its unequalled background of scientific research and practical experience, is readily coordinated with the work of your own engineers and welders in securing maximum speed, economy and dependability. For example:

It assisted a manufacturer of laundry equipment in obtaining ideal joints in sheet metal for vitreous enameling. The joints produced are strong enough to withstand the strains of the enameling process and so smooth as to become invisible.

It helped a chemical plant in developing corrosion resisting welds in aluminum pipe coils used in rosin manufacture.

It developed procedure controls for aircraft welding, including specialized training and severe qualification tests for the welders and careful inspection of every detail of the work.

These examples illustrate but a few of the many benefits Linde customers constantly receive from Linde Process Service. Consult the nearest Linde District Office for further facts showing how oxwelding and cutting under Linde Procedure Control can be of immediate benefit to you.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

126 Producing Plants UCC 627 Warehouse Stocks

IN CANADA, DOMINION OXYGEN COMPANY, LTD., TORONTO

District Offices

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LINDE OXYGEN • PREST-O-LITE ACETYLENE • OXWELD APPARATUS AND SUPPLIES • UNION CARBIDE

SEVENTEEN YEARS

IN A COAL MINE!

Actual photograph of SKF Bearing (type now obsolete) that served for seventeen years in a five-ton Jeffrey locomotive in the mines of the North East Coal Company, Paintsville, Ky.

SKF BEARING UNDER TRYING OPERATING CONDITIONS . . . ESTABLISHES SERVICE RECORD

Seventeen years ago this SKF Bearing went into a five-ton Jeffrey mining locomotive in the mines of the North East Coal Company, Paintsville, Ky. It operated steadily. There were no protracted shut-downs to make its job easier. And when finally, at the rare old bearing age of seventeen years, it was removed, it was not due to breakage or chipping, but because it had worn down gracefully.

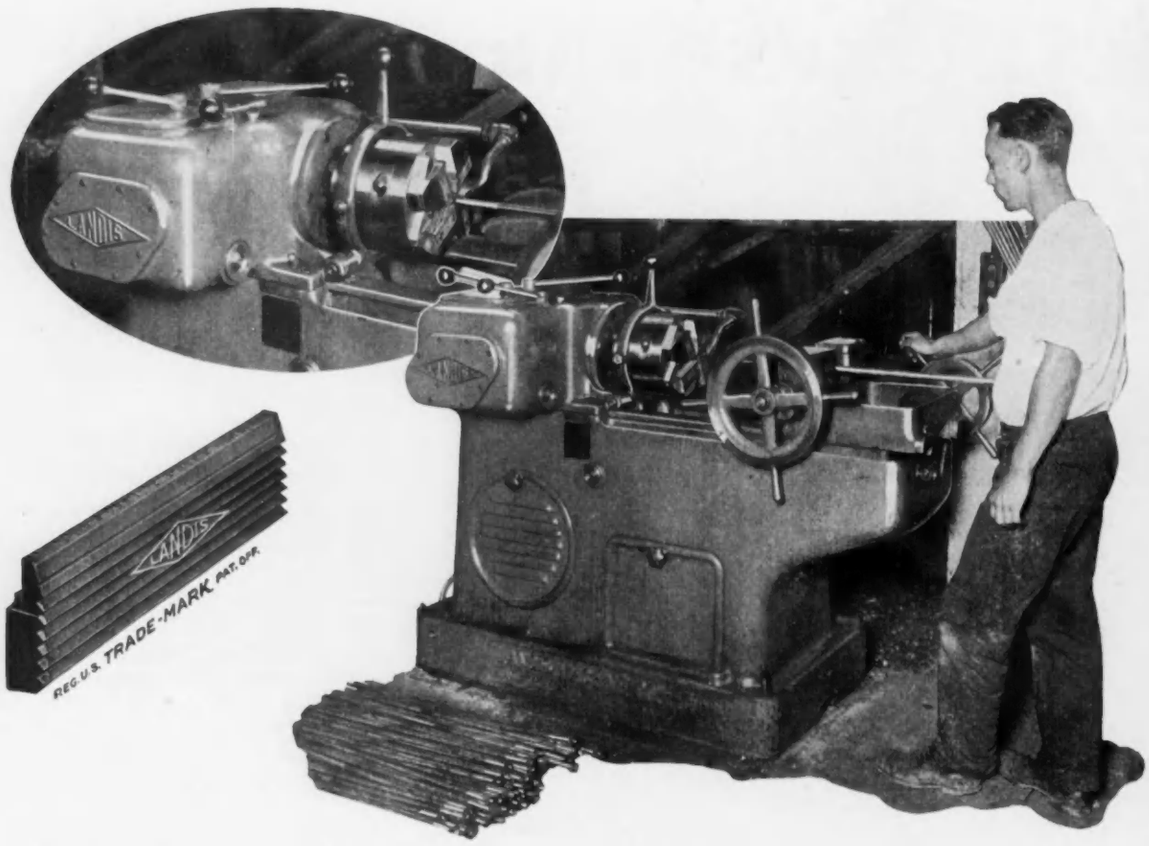
That sort of SKF performance has convinced American Industry that it is the *use* not the *price* of a bearing that determines real bearing economy. And manufacturers of bearing-equipped products should consider this important fact. The performance of this SKF Bearing was very definitely a contributing factor in the performance of the Jeffrey locomotive of which it was a part.

It does not pay to economize on bearings from any point of view. Usually it costs more to replace a cheap bearing than to buy the best that SKF ever produced. SKF Industries, Inc., 40 East 34th Street, New York, N. Y.

SKF
BALL AND ROLLER BEARINGS

A PROMISE IS ONLY A PROMISE... PERFORMANCE IS HISTORY!

2832



LANDIS *for* THREADING

LANDIS
REG. U.S. TRADE-MARK PAT. OFF.

» LANDIS offers the one complete line of threading equipment--thread cutting machines, pipe threading machines, thread cutting die heads and collapsible taps for practically every threading operation. Our experience and manufacturing facilities are the best guarantee that Landis equipment will handle your threading jobs to better advantage.

There are three reasons why threading jobs can be handled more profitably on a LANDMACO Threading Machine.

1. Because of high threading speeds and ease of operation, the LANDMACO will increase production.

2. The use of the LANDMACO will improve thread accuracy and finish. This modern machine is designed to produce work to modern requirements.

3. The LANDMACO employs the long life Landis Chaser. The substantial saving thus effected lowers production costs to the minimum.

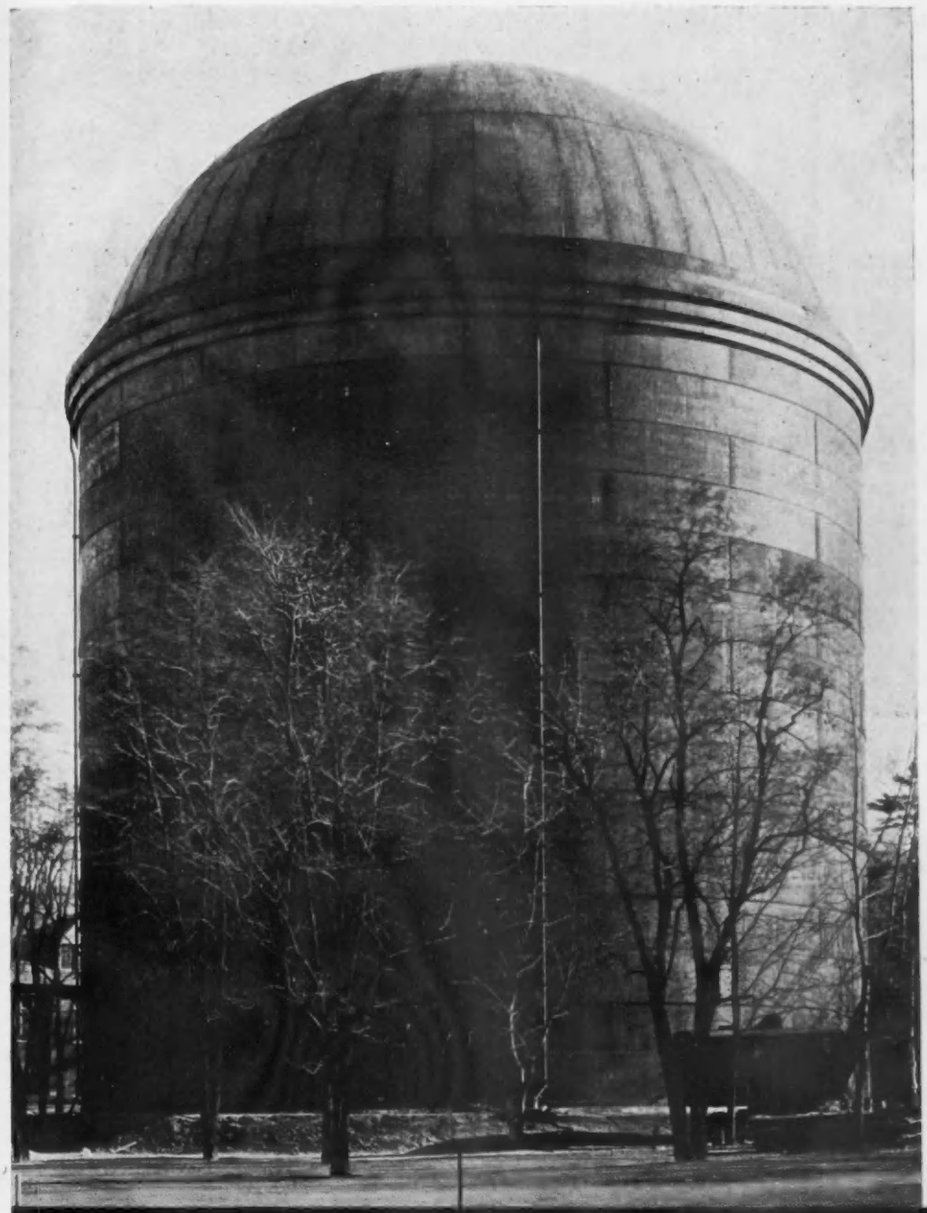
In its field, the LANDMACO Threading Machine is without equal. Its performance is as outstanding as its design.

Write us today for literature describing this new threading machine.

LANDIS MACHINE CO., Inc., Waynesboro, Penna.

Detroit Office: 5928 Second Blvd. **Cleveland Office: 504-505 Marshall Bldg.**

Sales Representatives in Principal Cities



Standpipe with capacity of 5,000,-000 gal. erected at Lancaster, Pa., by McClintic-Marshall Corporation

■

STEEL PLATE CONSTRUCTION

By reason of long experience in fabricating and erecting all types of steel-plate work, a force of skilled workmen, and unmatched facilities, McClintic-Marshall is exceptionally well qualified to meet the requirements of users of steel plate construction.

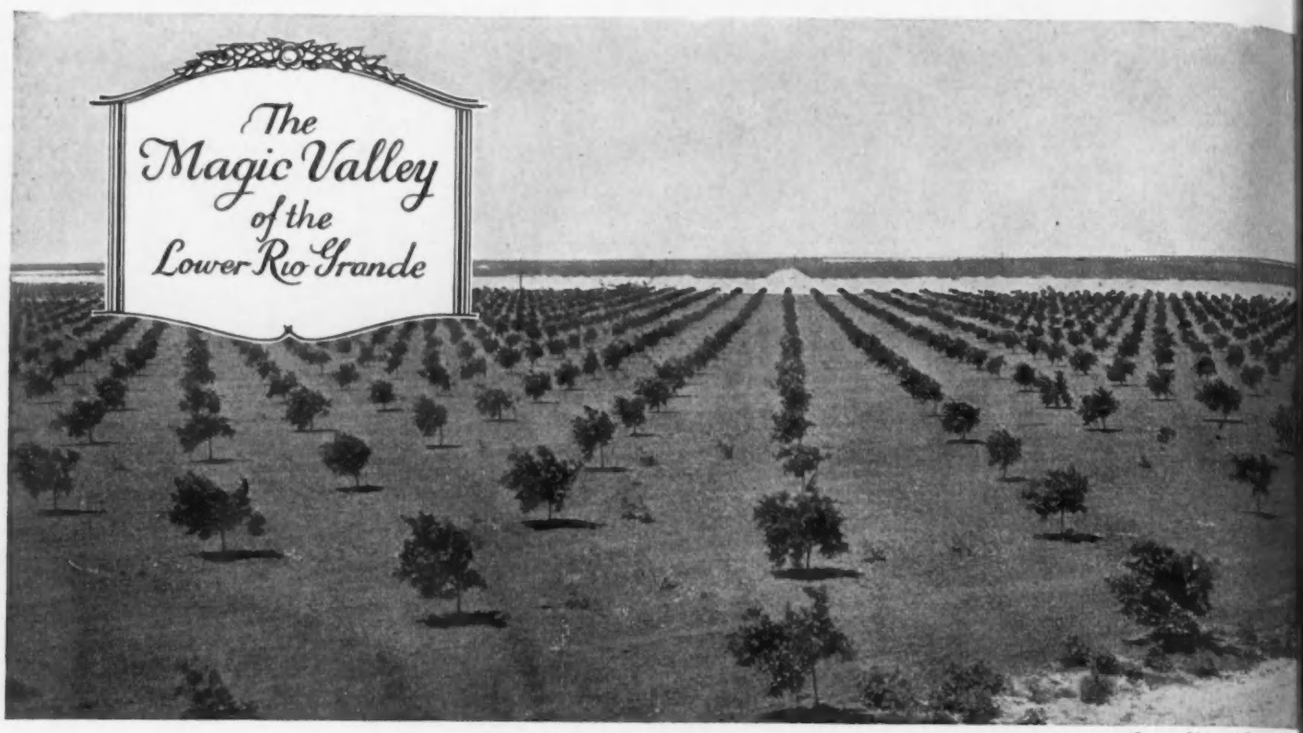
McClintic-Marshall Steel Standpipes, Elevated Water Tanks, Penstocks, Stacks, Oil Tanks, Gas Holders, High-Pressure Cylinders, Barges, and other products made of steel plate, are fabricated in the largest plant in the world devoted entirely to steel-plate construction, at Leetsdale, Pa., near Pittsburgh.

McClintic-Marshall's Hay Works at Newark, N. J., is advantageously located to fill promptly orders for steel-plate work in the Metropolitan area.

McCLINTIC-MARSHALL CORPORATION
Subsidiary of Bethlehem Steel Corporation
General Offices: Bethlehem, Pa.

District Offices in New York, Boston, Philadelphia, Baltimore, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, San Francisco, Los Angeles
Export Distributor: Bethlehem Steel Export Corporation, New York City

McClintic-Marshall



Courtesy Missouri Pacific Lines

Millions of Citrus Trees Protected by the Right Motor and the Right Control

FIFTEEN years ago, the Lower Rio Grande Valley was a semiwilderness of mesquite and cactus sparsely inhabited by ranchers and Mexican goat herders.

To-day, it is one of the garden spots of the world, with an ever-increasing population—now in excess of 200,000—attracted by the extremely fertile alluvial deposit.

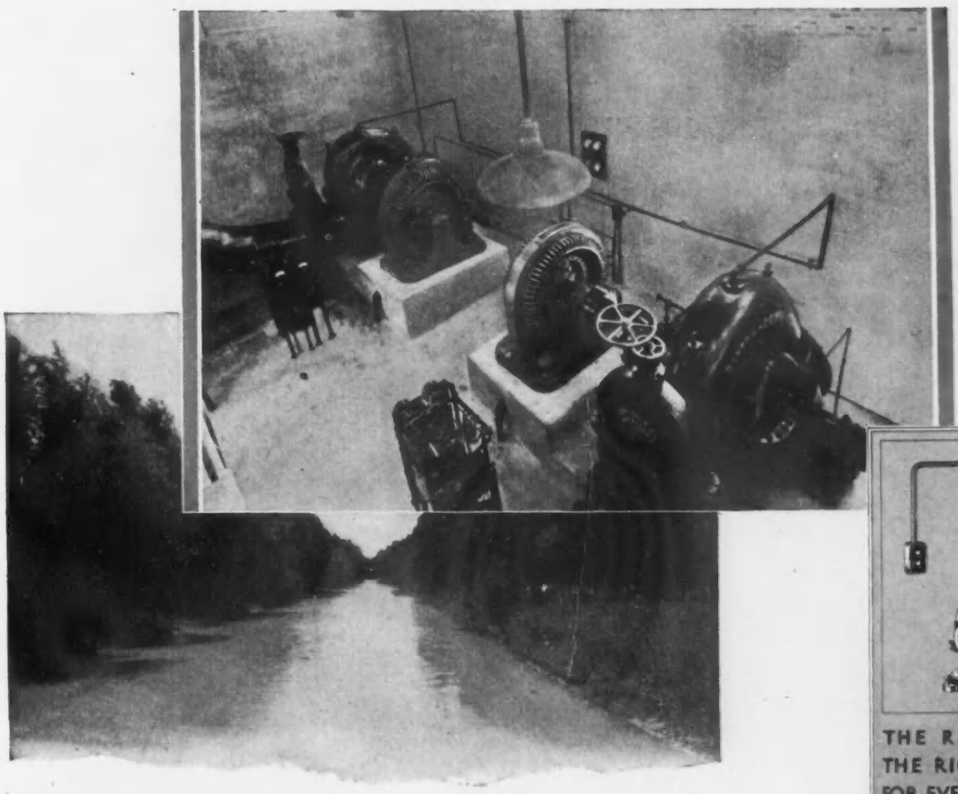
Water—simply water—has wrought this miracle. Water pumped from the Rio Grande River and distributed through 2500 miles of canals to 520,000 acres of land sustaining millions of citrus trees and large plantings of cotton and vegetables.

In 1925, General Electric sales engineers were called into the Valley by the Central Power & Light Company to aid in the electrification of the vast irrigation system.

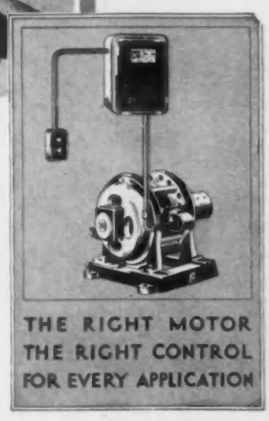
After a complete investigation, G-E salesmen, because of their thorough engineering training, were able to recommend the right motor and the right control for the initial installation. So successful was this application, that electricity, harnessed by G-E motors, went right up the Valley, changing over pump after pump from other types of drive to electric drive until to-day, there is installed over 18,000 hp. in G-E motors, all served by the Central Power and Light Company.

You may not be a fruit grower but you, too, can profit by the Right Motor and the Right Control

NOWADAYS, there are few radical differences between motors and controllers made by reputable and experienced manufacturers. Why then do so many executives continue to buy G-E equipment? It is because General Electric can supply the right motor and the right control for any of the thousands of industrial jobs; because General Electric field representatives are so well grounded in motor and control applications; because General Electric stands squarely back of its customers with conveniently located stocks and service shops; because General Electric maintains, primarily on a *service* basis, a complete renewal-part service to safeguard the customer. These and many other values are back of the widely prevailing expression, "I like to do business with the General Electric Company."



Two G-E 250-hp. synchronous motors, with the right G-E control, driving centrifugal pumps in the Donna River Pumping Plant, Donna, Texas



THE RIGHT MOTOR
THE RIGHT CONTROL
FOR EVERY APPLICATION

Typical irrigation canal in the lower Rio Grande Valley

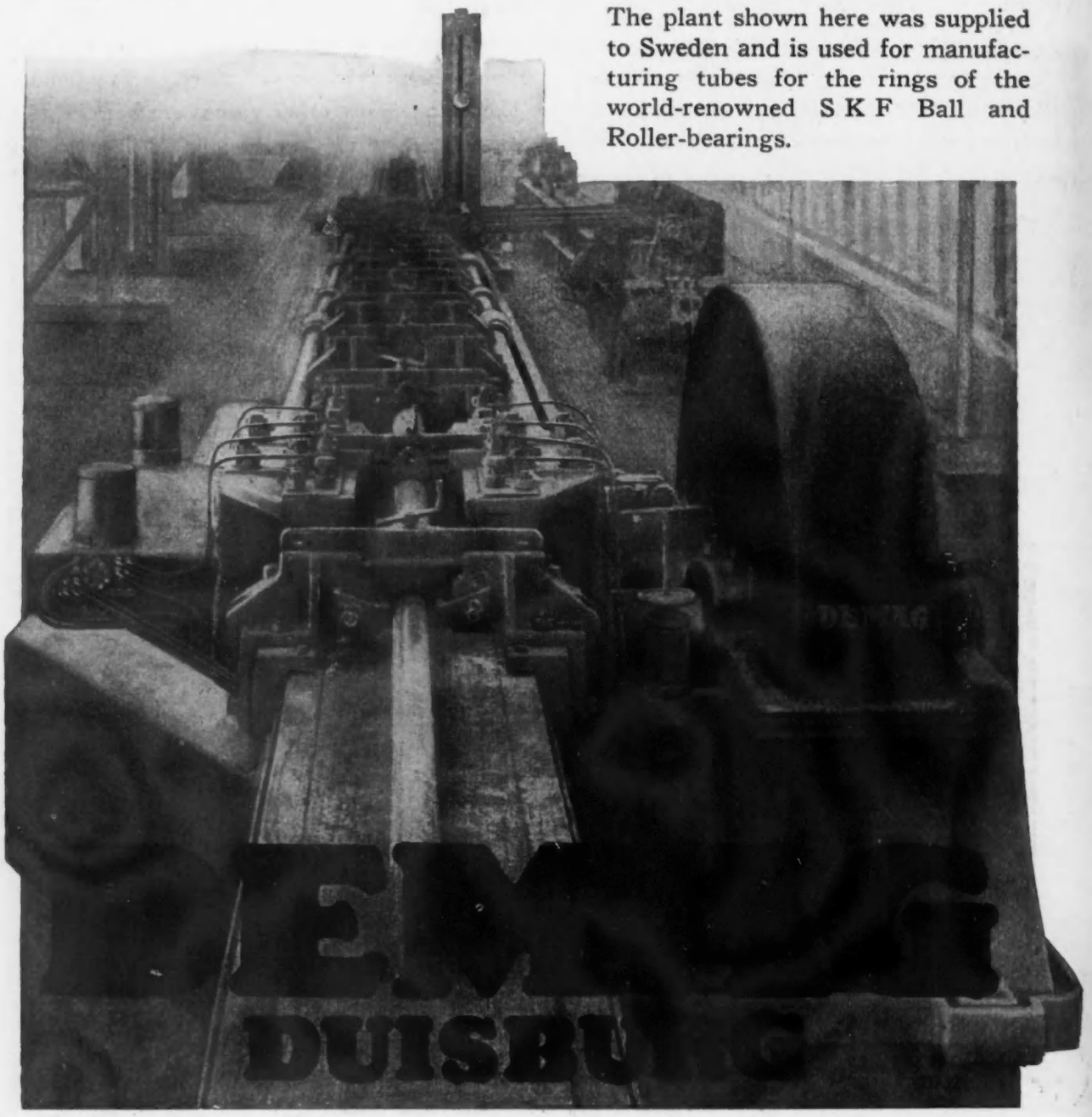
200-460

GENERAL ELECTRIC

DEMAG
PUSH-BENCH PLANTS

for seamless steel tubes of Thomas, open-hearth and special qualities, as well as of acid-proof and stainless material, &c.

The plant shown here was supplied to Sweden and is used for manufacturing tubes for the rings of the world-renowned S K F Ball and Roller-bearings.



Representative for U. S. A.: American DEMAG Corporation, 310 South Michigan Avenue, Chicago

Keep Your Capital Liquid .... by Using these Vast Facilities

19 acres of floor space—every facility for forming, drawing, stamping all metals

MANY manufacturing executives have found to their sorrow that money in the bank would have been much better than money tied up in over-extended plants and equipment. They won't be caught again . . . perhaps.

Those who have purchased stamped and formed metal parts from G. P. & F. —many of them for periods extending over decades—have really had a plant of their own without the heavy investment which is so burdensome in depressions. They have had the experience of our 50 years of specialization—they spend only as their production demands—they never need to expand their organization or plan excessively.

And when all is counted—cost of equipment, its upkeep, its idle periods, the "cutting and trying" which the long experience of G. P. & F. eliminates—they find that G. P. & F. can actually produce stampings cheaper than their own plant could hope to do.

Start investigating by mailing the coupon now. Or, better still, send a sample or blueprint for a definite quotation.

What these facilities mean told in this book.

GEUDER, PAESCHKE & FREY CO.
Sales Representatives in Principal Cities in All Parts of the Country
1415 West St. Paul Avenue, Milwaukee, Wis.
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Please send your booklet "In Harmony with Modern Progress"—without obligation or cost.

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(A-6803)

makes good steel better

In sheet steel for deep-stamping and especially automobile work, the value of adding Ferro Carbon Titanium to the ladle is reflected in a more uniform, ductile and durable product.

Many prominent mills, moreover, find that the yield of good steel is increased by this ladle addition, and that sounder, cleaner surfaces are produced. Obviously, this reduces costs.

The many years of practical experience which Titanium Alloy engineers represent are at your disposal. Let their recommendations enable you to apply FCT to your specific requirements — to make good steel better. Write today.

THE TITANIUM ALLOY MANUFACTURING CO.

NIAGARA FALLS, N. Y.

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60 John Street
New York

Keith Building
Cleveland

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GREAT BRITAIN AND EUROPE
T. Rowlands & Co., Ltd., Sheffield, Eng.

INSPECTION

»»»»A Vital Element in Quality Production

UNION Drawn conducts an extensive system of inspection throughout its mills that checks products at all stages of manufacture. The personnel of this department are experienced operators and skilled metallurgists, schooled in the understanding of our customers' particular needs.

During all the production processes, these men are wide awake to the detection of errors or defects—making sure that the highest quality standard is unimpaired.

UNION DRAWN STEEL CO.

BEAVER FALLS, PA.

TURNED AND POLISHED SHAFTING

SHAFTING is the product on which the cold finished steel industry was originally founded and its manufacture has always constituted an important branch of the business. The use of the early cold rolled shafting has long ago been replaced by the turned and polished shafting of today.

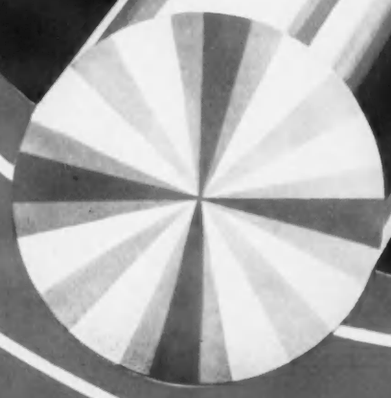
Union Turned and Polished Shafting is uniform and produced to close tolerances in order that its application will engender the greatest mechanical efficiency. Sizes range up to and including 8 inch diameter. When required, bars are key-seated to blue print specifications.

This shafting is usually furnished in low carbon open hearth steel which can be machined readily if desired. For many purposes, high carbon steels are demanded as well as alloy steels and frequently heat treatments are essential.

UNION DRAWN STEEL CO.

BEAVER FALLS, PA.

UNION DRAWN STEELS



Forms 100 feet of 30" pipe per minute

Sizes and straightens 100 feet of 36" pipe per minute

THE GIANTS OF PIPE MACHINERY

The forming mill is equipped with steel housings—hardened and ground rolls—roller bearings. It has a capacity for forming pipe from 16 to 30 inches inclusive with wall thickness up to ¾ inch. Produces seams suitable for welding.

The sizing and straightening mill is a six stand unit for pipe ranging from 16 to 36 inches inclusive and in any length. It is equipped with anti-friction bearings throughout. All rolls are brought to contour by micrometer adjustment.

These mills are backed by over twenty years experience in developing Cold Roll Forming Machines. Our pipe equipment handles all sizes from ⅛ inch to 36 inches diameter, and wall thickness from tin plate to ¾ inch.

Designed and Built by YODER

Builders of

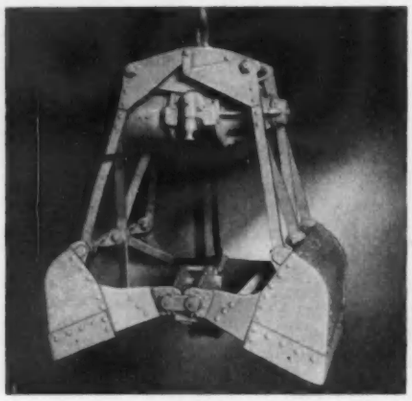
Gang Slitting Shears
Rotary Shears
Automobile Sheet Metal Forming Machines
Pipe Forming Machines

Consult our engineers on your sheet or plate problems

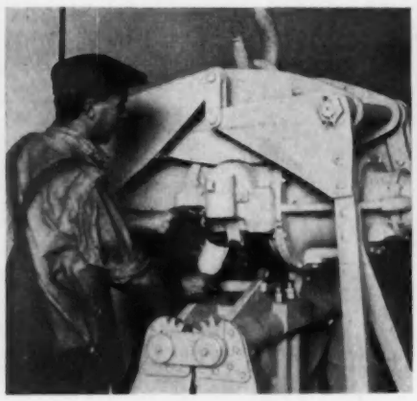
THE YODER COMPANY
W. 55 ST. and WALWORTH AVE. CLEVELAND, OHIO
PLATE AND SHEET METAL MACHINERY SPECIALISTS

Here's the

A B C



Hook the Bucket to the crane



Plug in the electric cable

Pull the control lever to "open"

of Hayward Electric Bucket Operation

Simplicity is the keynote of materials handling when it is done with this Hayward Electric Motor Clam Shell. Using this Hayward is as easy as A, B, C.

Hook the bucket to the crane. Most any type of crane, derrick, or hoisting apparatus will serve. Then plug in the electric cable. Now the bucket is ready. The man in the crane cab lowers the bucket in the open position, then with a single lever operation, closes the bucket on the material to be handled . . . coal, coke, refuse, foundry sand, or limestone. Instantly the self-contained electric motor acts, and the bucket grabs a capacity load.

That's materials handling in the modern manner . . . simple, swift, saving. A Hayward Electric Motor Clam Shell is an all-round bucket for the foundry . . . a bucket that multiplies crane utility, and gets more done in less time, with less effort.

Write for the Hayward Electric Motor Bucket Bulletin

THE HAYWARD COMPANY
46-50 Church St. . . . New York, N. Y.
Cleveland Chicago San Francisco

HAYWARD BUCKETS
HAYCO

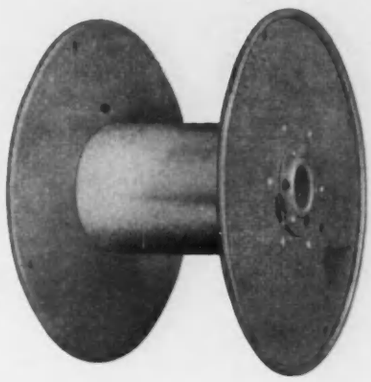
ELECTRIC MOTOR
ORANGE PEEL
CLAM SHELL
DRAG LINE

Having four different types of digging and rehandling buckets to draw from, makes a Hayward recommendation absolutely unbiased.

Hayward Buckets

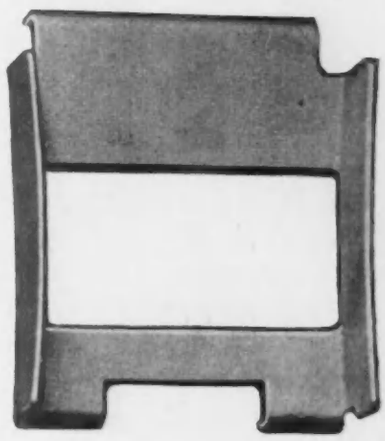
3 Unusual Links In Stamping Service

HAVE you had difficulty in getting the quality of alloy steel stampings that your particular service requires? If you need greater strength we can suggest special steels that we know from 25 years use of alloy steels and heat treating can be stamped, and what results you will secure.



An accurate knowledge of alloy steel, stainless steel and what heat treatments they should have constitute three unusual links in a stamping service which Parish offers.

Parish production of alloy steel stampings is large enough to maintain a complete chemical and physical laboratory out of which come new alloy steel analysis and the right heat treating procedure for all the various alloy steels.



The Parish laboratory *introduced* high manganese steel to stamping users, and now comes another new Parish development—chrome manganese steel which replaces more costly alloys without sacrificing any of the desired qualities.

Can you afford the risk of buying alloy steel stampings from a plant that does not study your problem in a laboratory? Safeguard your product's reputation with Parish alloy steel stampings. They are guaranteed against "off analysis." Every heat treated stamping is Brinell tested to give you the kind of service your stamping demands.

Parish also makes production stampings of soft steel.

Parish Pressed Steel Co.

READING, PA.

Pacific Coast Representative: F. SOMERS PETERSON CO.
57 California St., San Francisco, Cal.

J-METAL HAYNES STELLITE

for faster machining

at Low Initial *and* Final Tool Cost

J-METAL is a new and improved grade of Haynes Stellite. Its initial cost is low; it is easy to grind; and because of its performance, final cost per piece machined is surprisingly low.

J-METAL Haynes Stellite is available in the form of tool bits, welded tipped tools, and milling, boring and reaming blades in all standard styles and sizes. Special tools can be made to order.

Haynes Stellite Engineers will be glad to demonstrate how J-METAL Haynes Stellite can increase production and lower tool costs in your plant. Their assistance is offered as part of Haynes Stellite Engineering Service. Take advantage of it today.

J-METAL HAYNES STELLITE TRADE MARK

This trade-mark on a cutting tool means that the skill and resources of the Union Carbide and Carbon Research Laboratories, Inc., and the Haynes Stellite Company, the pioneer manufacturers of non-ferrous red-hard cutting tools and wear-resisting alloys, have gone into its development and manufacture, and that Haynes Stellite Engineering Service is back of it to insure its proper and economical use.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

CHICAGO CLEVELAND HOUSTON DETROIT LOS ANGELES NEW YORK SAN FRANCISCO TULSA

General Offices and Works—Kokomo, Indiana
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Haynes Stellite Welding Rods and information on other Haynes Stellite products also are available through the 42 apparatus shipping points of The Linde Air Products Company

When the Emergency comes—

rely on GOOD alloy steel to meet the test

ILLINOIS *alloy* STEEL

ALWAYS DEPENDABLE

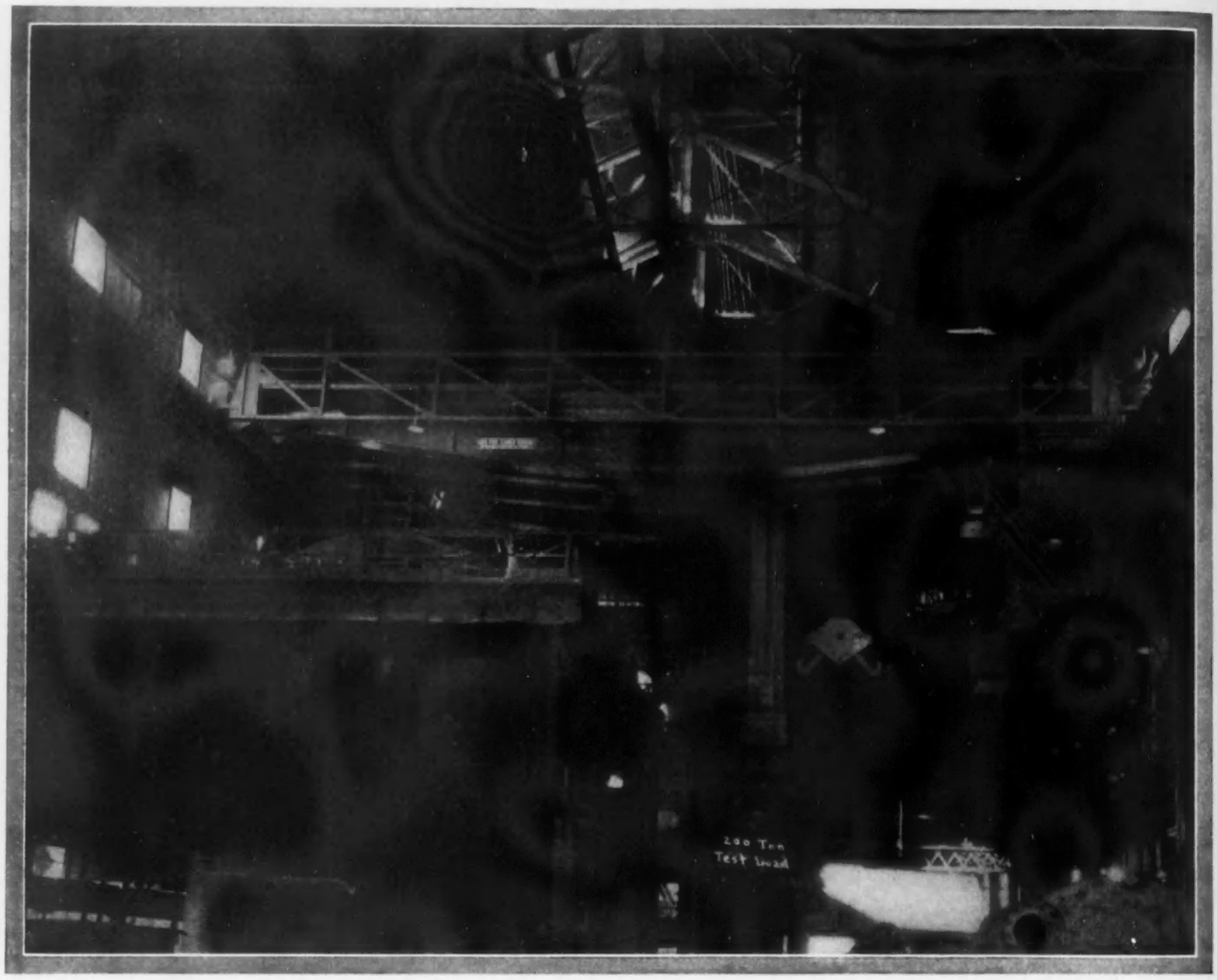
Controlled production of Illinois Alloy Steel means controlled quality in every heat.

Illinois Steel Company
SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 South La Salle Street, Chicago, Illinois

MORGAN ENGINEERING (MECo) MEANS MILL EFFICIENCY

MORGAN • LADLE • CRANE



Morgan 150-ton 7-motor 6-girder 89'-0" Span Ladle Crane handling a test load of 200 tons

Roller bearings are provided throughout to exclude grit and cast house graphite. All hoist gears are of the herringbone type. Auxiliary girders are provided for supporting bridge motors, cages, etc. . . . Two cages are provided, one for the operator and one for control equipment.

Write for Bulletin No. 23

8

THE
MORGAN ENGINEERING
COMPANY
NEW YORK
25 BROADWAY
ALLIANCE, OHIO, U.S.A.
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MORGAN DESIGNS AND BUILDS
Blooming Mills · Plate Mills
Structural Mills
Continuous Mills
Rod and Bar Mills
Electric Traveling Cranes
Steam Hydraulic Forging Presses
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DESIGNERS · MANUFACTURERS · CONTRACTORS

"BIKEKO"

In changing from one size to another, it is only necessary to remove one screw and re-insert in the proper hole for the next size. Additional adjustment is obtained with the fine pitch adjusting screw. A record is made of the final scale reading for each standard size, so there is no loss of time in resetting after a change is made. The "Bikeko" die-heads can be furnished on new Peerless and P.D.Q.C. machines and for any heavy, power driven, threading machine now in service.

EQUIPPED MACHINES *Pay* THREADING PROFITS

AND THE REASONS—

1. Dies can be driven at top speeds on any heavy duty power threading machine.
2. Quick set up for a wide range of sizes with one set of dies, because of UNUSUALLY long die slides.
3. Quick action, positive die release lever.
4. Any one die can be quickly replaced.
5. Fine pitch adjusting screw for all sizes, special or regular.
6. Positive Lock for duplicate thread adjustment.

AND THE OTHER REASONS are described in our Bulletin—write for it.

BIGNALL & KEELER MACHINE WORKS
of the N. O. NELSON MFG. CO.
Edwardsville Illinois

PEERLESS B&K DUPLEX P·D·Q·C

MARSHALLTOWN THROATLESS SHEARS

Shear No. 112

Irregular outlines, in and out curves—all of these may be cut just as easily as a straight splitting operation on sheets from ½" thick down to the lightest gages.

These results are obtained from the Marshalltown Throatless Shear here illustrated. The shear makes a clean cut at the rate of 6 ft. per minute, and may be equipped with belt or motor drive. Cuts 10" radius.

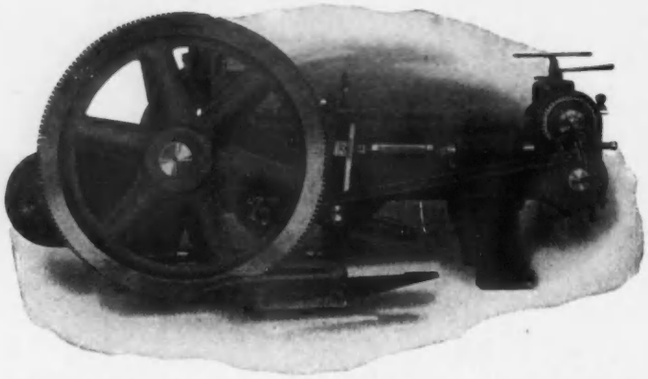
WE BUILD

Double Rotary Bevel Shears, Inverted Bevel Shears, Throatless Shears, Splitting Shears, Bending Rolls, All Types of Circle-Shear Blades

MARSHALLTOWN MANUFACTURING CO.

MARSHALLTOWN, IOWA, U. S. A.

MANVILLE COLD HEADERS



Manville Double Stroke Solid Die Cold Headers are fast, accurate production machines for cold forging cap, lag, machine screw blanks, rivets and special headings. Submit your heading problems.

We also build

Bolt Trimmers
Cap Screw Trimmers
Thread Rollers
Nut Machines
Screw Slotters
Wire Formers
Power Presses
Ball Blank Headers

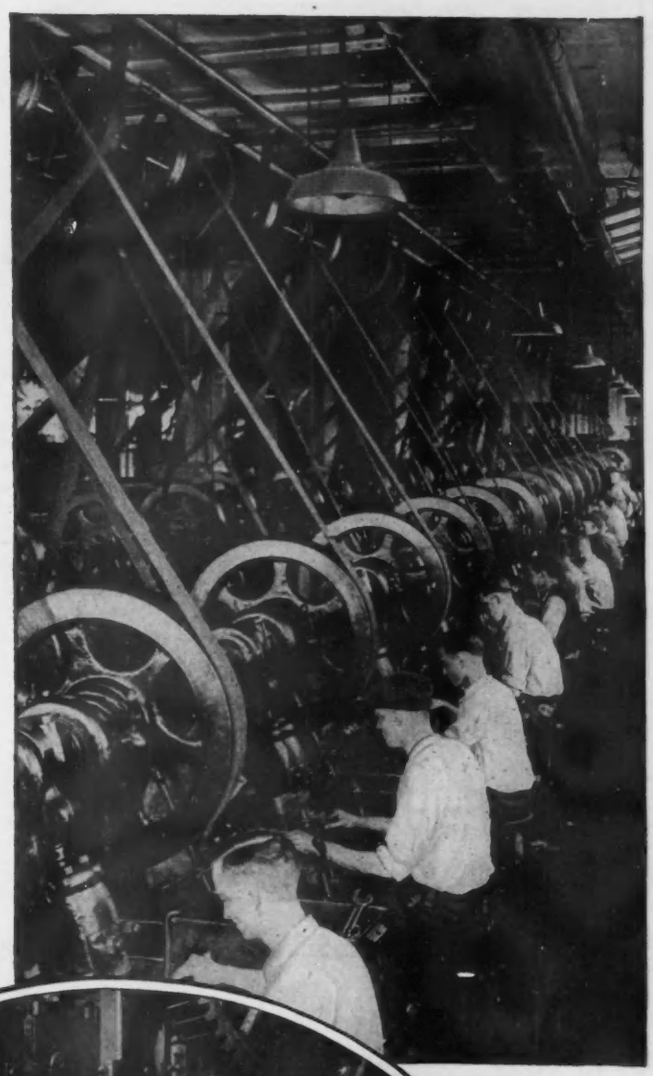
and various other special machines for the rapid and economical production of Cold Forged Products.

THE E. J. MANVILLE MACHINE COMPANY

HOME OFFICE AND WORKS—WATERBURY, CONN., U. S. A.

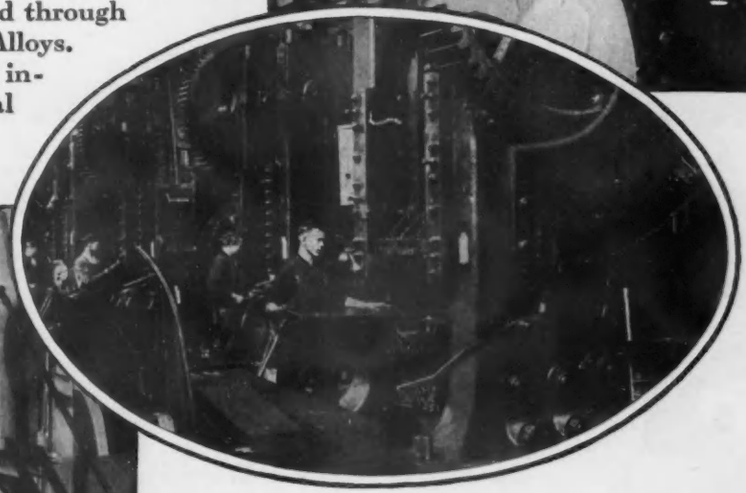
Branch Offices: 1209 Swetland Building, Cleveland, Ohio
Stephenson Building, Detroit, Mich.

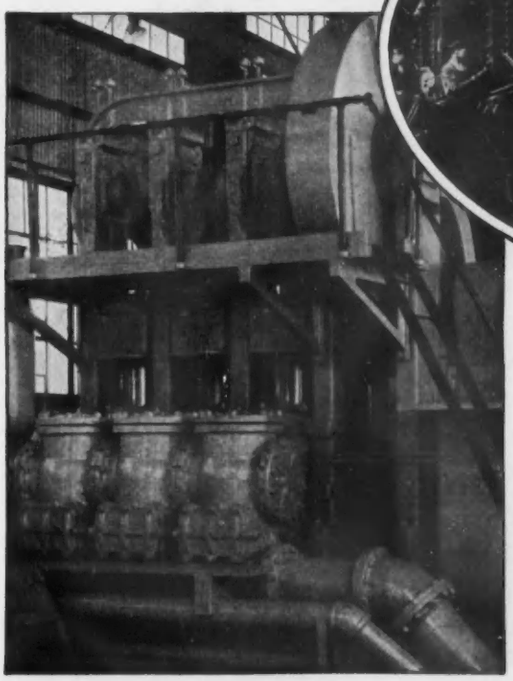
Investigate Alloy Steel and Iron...



OPERATORS planning new equipment cannot afford to overlook the repeatedly demonstrated superior qualities to be found in Alloy Steel and Iron. Increased capacity . . . reduced weight . . . longer life . . . and higher operating efficiencies, made possible through small additions of Ferro-Alloys containing the elements chromium, manganese, vanadium and silicon, represent returns on your equipment investment compelling thorough investigation.

Electromet engineers will gladly explain how lighter and stronger equipment may be provided—and greater resistance of individual parts to shock, abrasion, corrosion, distortion and fatigue assured through the proper use of Ferro-Alloys. Write today for further information and additional facts of interest.

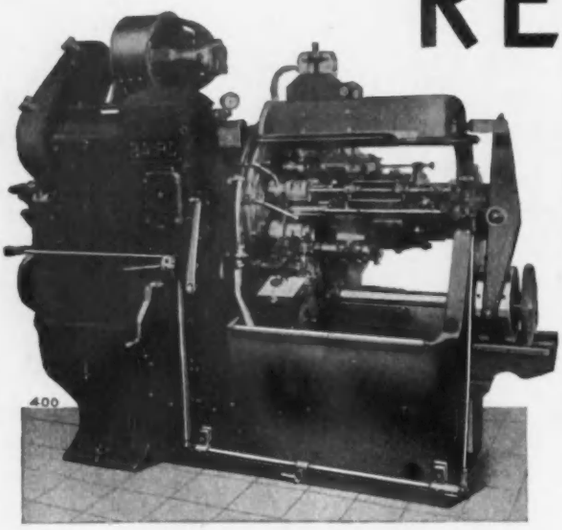




ELECTRO METALLURGICAL SALES CORP.
Unit of Union Carbide UCC *and Carbon Corporation*
Carbide and Carbon Building, 30 East 42nd Street
New York, N. Y.

Electromet
Ferro-Alloys & Metals

MACHINE HOUR TIME AND OVERHEAD
REDUCED



Less machine hour time, because the BAIRD Automatic Horizontal Multiple Spindle Lathe will perform all roughing and finishing operations simultaneously, in 22 seconds to 10½ minutes per piece. Less overhead, because this remarkable 6 spindle machine will outperform half a dozen single spindle machines, thus taking less floor space and reducing maintenance. Versatile, because of quick set-up provisions for 21 tools on different operations. Made in two types; one for chucked work, one for turning work on centers, and horizontal and vertical.

Write for catalog and detail information.

"Ask BAIRD About It"

THE BAIRD MACHINE CO., Bridgeport, Conn.

DROP
and UPSET FORGINGS

Dull clods of metal—yet users know, if they came from the hammers and furnaces of Union Switch, that they will be:

Right in metallurgical analysis
Right in metal texture
Right in machining allowances
Right in heat treatment
Right in cost

Thus they are relieved of machining and assembly delays, relieved of the fear of failure in service.

Any alloy, any heat treatment, size to 500 lbs. each; capacity 3000 tons a month.

Send samples or blueprints for estimate.

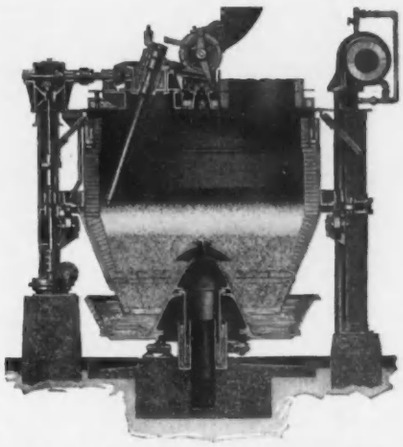
UNION SWITCH AND SIGNAL CO.

DROP FORGE DIVISION — PITTSBURGH DISTRICT, SWISSVALE, PA.

This is an enlarged view of the new "WOOD" patented Coal Feeder

Uniformly Rich Gas at Low Cost

The uniform distribution of fuel in small quantities by the *gas-tight* coal feeder; the constant mechanical agitation of the entire fuel bed resulting in rapid gasification and the continuous ash removal which maintains the fuel bed at a constant level, are the *operation* features of the "WOOD" fully Automatic Gas Producers which ensure a steady flow of uniformly rich gas at low cost. As operation is automatic, labor charges are reduced to the minimum. The large gas output decreases the number of producers required. The cost of maintenance is almost negligible.



Write for full information. We will arrange for you to inspect an installation in regular operation, where these advantages will be demonstrated.

R. D. WOOD & COMPANY
PHILADELPHIA

Designers and Builders of Mechanical Gas Producers since 1889

LARGEST BUILDERS OF THE WORLD'S LARGEST CRANES

Alliance Products

STANDARD CRANES
Up to 430 tons capacity
STRIPPING CRANES
Up to 320 tons capacity
COMBINATION CHARGERS and STRIPPERS
Up to 200 tons capacity

Ladle Cranes
Ingot Strippers
Soaking Pit Cranes
Open Hearth Charging Machines
Slab and Billet Charging and Drawing Machines
Gantry Cranes
Ore and Coal Bridges
Car Dumpers
Forging Manipulators
Steam Drop Forge Hammers
Coke Pushers, Levelers and Door Lifters
Coal Pier Equipment
Rolling Mill Machinery
Cement Plant Machinery
Dock Handling Equipment
Coke Oven Equipment

271 of 100 Tons Capacity and over

LADLE AND STANDARD CRANES

59		100 tons
2	WORM DRIVEN Ladle..	100 tons
2		115 tons
6	WORM DRIVEN Ladle..	125 tons
45		125 tons
30		150 tons
3	WORM DRIVEN Ladle..	150 tons
6	WORM DRIVEN Ladle..	160 tons
2	WORM DRIVEN Ladle..	165 tons
4	WORM DRIVEN Ladle..	175 tons
27		175 tons
3	WORM DRIVEN Ladle..	200 tons
4		200 tons
5		225 tons
1		250 tons
3	WORM DRIVEN Ladle..	250 tons
3	WORM DRIVEN Ladle..	275 tons
1		275 tons
1		300 tons
3		430 tons

STRIPPING CRANES

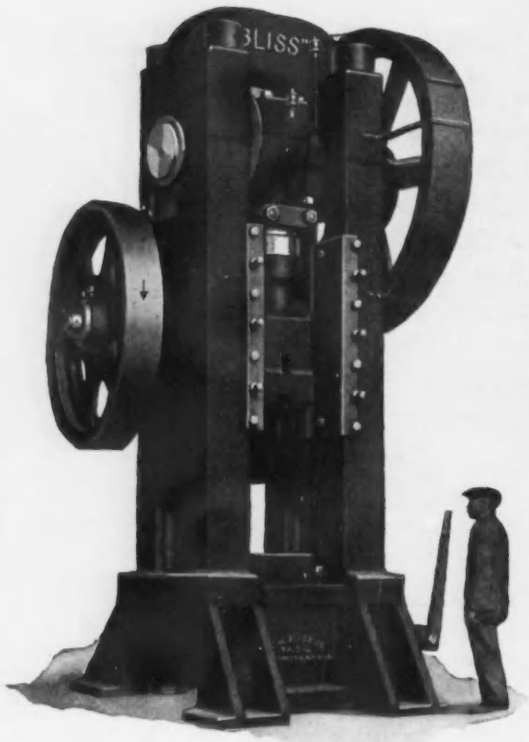
8		100 tons
1		125 tons
21		150 tons
19		200 tons
1	Single Ram,	320 tons

COMBINATION CHARGERS AND STRIPPERS

3		100 tons
1		125 tons
3		150 tons
4		200 tons

Give Us the Runway and We will Lift the World

THE ALLIANCE MACHINE CO.
ALLIANCE, OHIO, U.S.A.
ENGINEERS AND BUILDERS



STRAIGHT SIDE PRESSES
ECCENTRIC SHAFT TYPE

While limited in stroke, the eccentric shaft type of press shown will carry a considerable greater load with less spring than the crank type shaft and with little danger of being bent by an overload. Due to shaft construction, the width of frame between uprights and gibs is materially narrower than in the standard single crank straight side presses.

Built in twelve sizes these presses are adapted for heavy blanking, heavy shallow forming and embossing jobs, hot and cold sizing work, etc.

Building a size and type of press for every requirement, we are able to furnish a press exactly suited to your needs.

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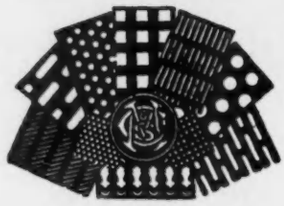
PERFORATED METALS

Large stocks of all metals always in hand ready to punch for any arrangement of perforations.

Sixty-one years of manufacturing perforated metals for every conceivable purpose assures satisfaction.

Write for Catalog of Patterns.



TIN, STEEL, COPPER, ALUMINUM, BRONZE, BRASS, ZINC, ANY METAL, ANY PURPOSE

CHARLES MUNDT & SONS
50 FAIRMOUNT AVE., JERSEY CITY, N. J.

Cone 4-Spindle Automatics

Are economical and accurate producers of screw machine parts up to 6" diameter 7" milling length. They cut costs, increase production, boost profits.

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Chicago: John H. Glover, 2127 North Sayre Ave., Chicago, Ill.
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Indiana: G. A. Richey, Chamber of Commerce Bldg., Indianapolis, Ind.
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Pennsylvania: Arch Machinery Co., 1005 Park Bldg., Pittsburgh, Pa.
Philadelphia: Lloyd & Arms, Inc., 133 South 36th St., Philadelphia, Pa.
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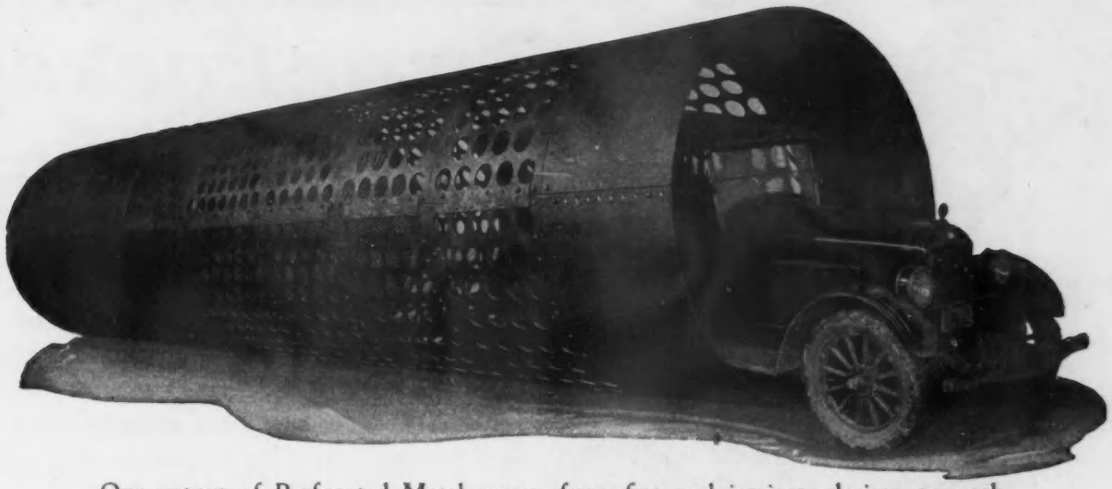
Automatic Chucking Machines

Manufacturers of a complete line of multiple-spindle chucking machines:
Work- and tool-revolving types.
Five different sizes.
Two, three, four, and five tooling positions.
We invite your inquiries.

Goss & DE Leeuw Mach. Co.
New Britain, Conn.

PERFORATED METALS



Our output of Perforated Metal ranges from fine and intricate designs to work of large dimensions as shown above, which cylinder was 9 ft. in diameter by 38 ft. long, made of ½" steel.

Whatever your requirements in Perforated Metal, we would like an opportunity to serve you.

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Piano Wire — **Phonograph Needle Wire**
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MAKE your own comparisons—your own tests. Send for a sample Ferry Cap Screw or Set Screw and check it point for point against any other make. Then you'll *know* why Ferry is proud of an unusual record — twenty-five years of consistent effort to supply industry with cap screws, set screws and other screw machine products of *unquestioned* superiority. Just look in a Ferry package.

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Cleveland, Ohio

PATRONIZE FERRY JOBBERS
LOCATED EVERYWHERE
THEY CARRY COMPLETE STOCKS

FERRY
PROCESS SCREWS

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All Sizes and Descriptions
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Machinists' Tools — Cutters and Hobs
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One to Six Spindles
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(HORIZONTAL) BORING MACHINES
UNIVERSAL BORING MACHINE CO.
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Combines in a single machine facilities for every possible grinding operation required in a machine shop. Write for Bulletin No. 18.
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MERRELL
PIPE THREADING for BETTER threads MACHINES
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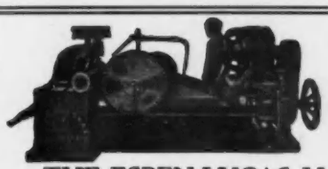
Cutting Off Machines for Sawing All Kinds of Metals
THE ESPEN-LUCAS MACHINE WORKS
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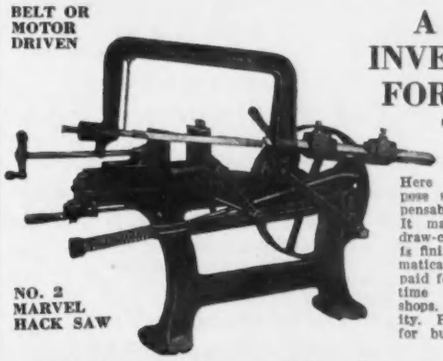
BELT OR MOTOR DRIVEN

NO. 2 MARVEL HACK SAW
A SAFE INVESTMENT FOR YEARS TO COME
Here is a general purpose saw that is indispensable to every shop. It makes a clean fast draw-cut, and when cut is finished it stops automatically. This saw has paid for itself in a short time in hundreds of shops. Eight inch capacity. Price is low. Write for bulletin.
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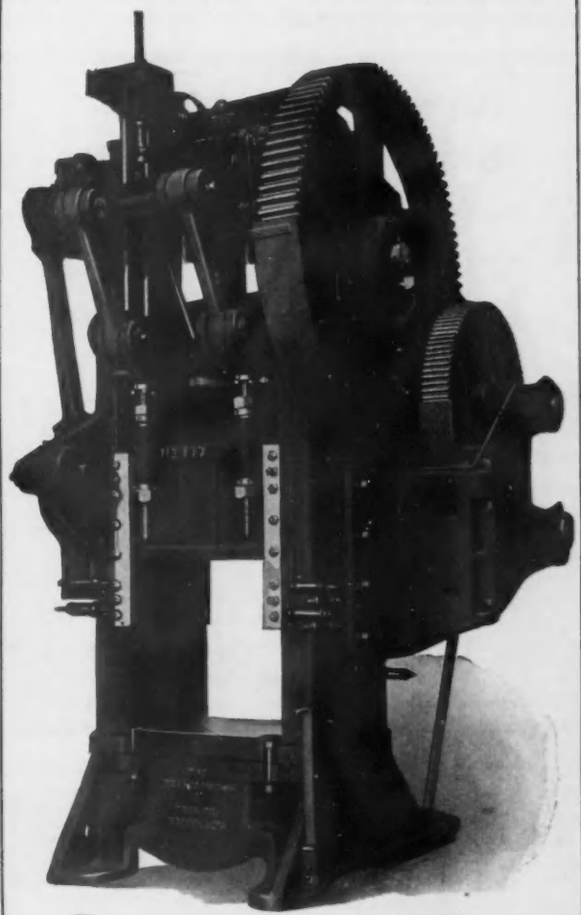
Patented
Single Crank Toggle
DRAWING PRESSES

DESIGNED and built in 50 different sizes, weighing from 6,500 to 500,000 pounds for work varying from cups to automobile bodies.
The "Toledo" improved multiple disc friction clutch is regularly furnished on these presses.
PRESSES FOR EVERY PURPOSE
Over two thousand patterns from which to choose.
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—for thin and thick wall steel tubing and bars

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We also manufacture a large line of turret machinery for finishing cast iron, steel and brass.

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CUT THREADS
BETTER
QUICKER
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Sizes and Styles
for All Machines

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Save time and inconvenience of replacing broken punches. They last longer and cost but a fraction more than other makes.

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Twist Drills—Hobs
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If it is a screw thread, Geometric has the tool to cut it.

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AUTOMATIC FEEDS
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Collapsible Taps, Self-opening Die Heads, Threading Machines, Pipe Cutting-Off Machines.

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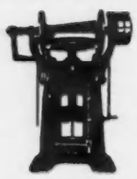

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The Presses for hot pressed brass parts. Excellent for cold pressing, coining, etc.

Also all other types of Power Presses. Up-to-the-minute construction. Fully safeguarded. Automatic feeds.

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Two Sizes **CUTTERS** Nos. 1-2

We make the regular Huntington (Pattern) for all sizes. Roughing for Nos. 1 and 2. Paragon for No. 1 only.

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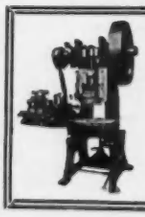

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Roll Feeds for feeding flat stock. Dial—Magazine—Hopper Feeds for forming operations.

Reels for handling coiled stock.

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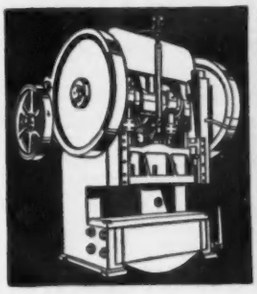
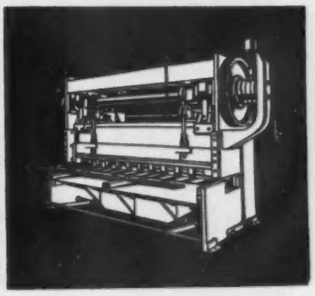

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The Watson-Stillman kind, in which quality has been the factor for over 80 years.

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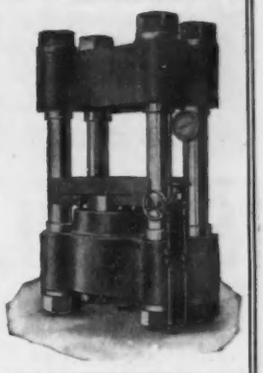
We will modify standard construction to meet special conditions.



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RICHARD DUDGEON, Inc.
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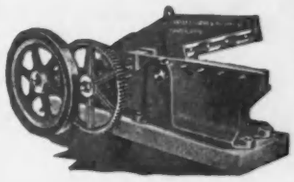
JACKS, CAR PROPELLERS, PUMPS, PRESSES, PUNCHES
FILTER PRESS JACKS AND ROLLER TUBE EXPANDERS
ESTABLISHED 1850 BROOME & COLUMBIA STREETS NEW YORK CITY

Canton Alligator Shear

Solid Steel Throughout



If you cut bars, sheets, or scrap, you can save money both in power and operating costs by installing a Canton All Steel Alligator Shear.

Its solid steel construction assures you of many years of profitable service.

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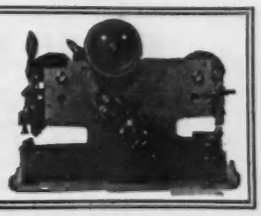
PELS
SHEARS
PUNCHES
PRESSES
UNBREAKABLE
STEEL PLATE FRAME



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ROLLS and PRESS BRAKES
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Pig Iron—Open Hearth Steel—Billets—Slabs—Sheet Bars—Skelp—Angles, Beams and Channels—Round, Square and Flat Bars—Rails—Steel Plates—Tie Plates—Splice Bars—Reinforcing Bars—Coke Tin Plate—Kanners Special Cokes—Best Cokes—Charcoals—Lacquered Tin Plate—Tin Mill Black Plate (All Finishes)—Lacquered Black Plate—Copper Bearing Terne Plate—Hot and Cold Rolled Strip Steel and Strip Steel Sheets—High Finish Sheets—Long Terne Sheets (Common and Special Finishes)—Galvanized, Black and Blue Annealed Sheets—Corrugated Sheets, V Crimp Sheets, Roll Roofing—Single Pickled, Full Finished and Auto Body Sheets—Coke — Tar — Benzol—Toluol—Ammonium Sulphate

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WEIRTON W. VA.
Division of National Steel Corporation
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VALLEY MOULD AND IRON CORPORATION
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Manufacturers of
HIGH GRADE BAR IRON
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DRILLED HOLLOW STAYBOLTS
AND IRON BOILER RIVETS
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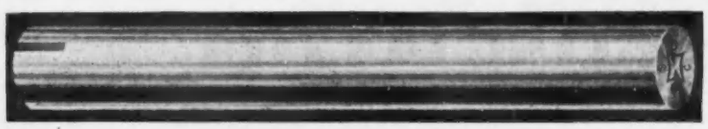
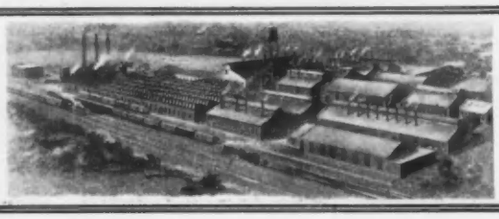
BETHLEHEM

CUMBERLAND
TURNED *and* GROUND SHAFTS
"Ground to Micrometer Accuracy"



CUMBERLAND STEEL COMPANY, CUMBERLAND, MD., U. S. A.



THE ATHENIA STEEL CO.
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Makers of High Grade Tempered and Polished Steel for Clock, Watch, Motor and Typewriter Springs. Also Wound Springs. Tempered and Untempered Steel for other purposes. Special quality equal to finest imported for finish and accurate rolling. Also Stainless Steels of various grades.
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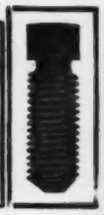

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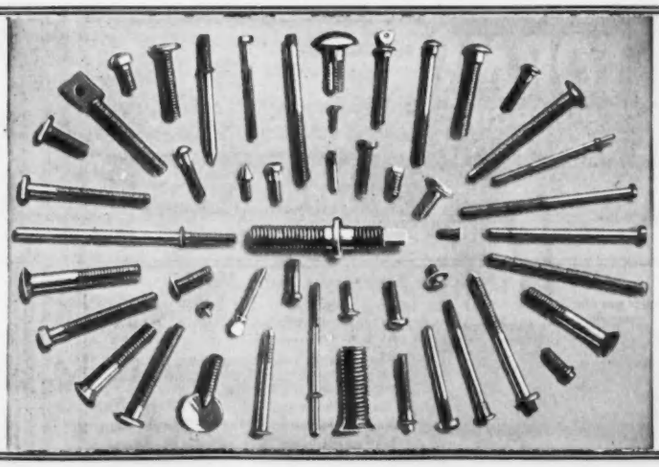

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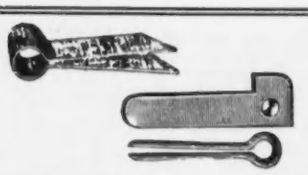

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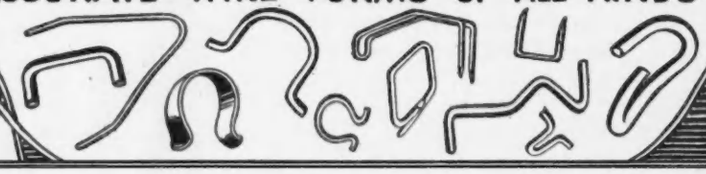

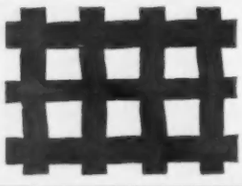

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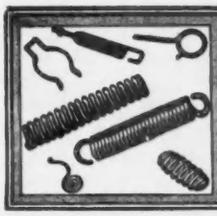

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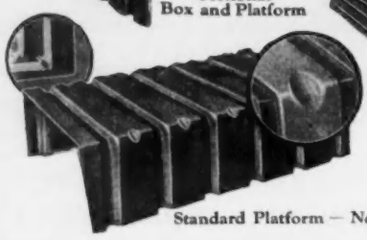

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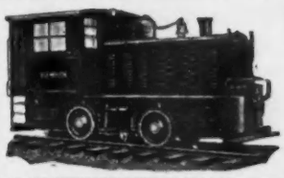

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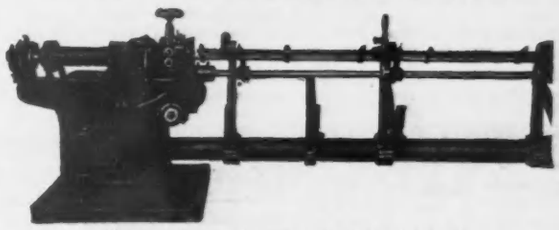

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Amer. Spring & Mfg. Corp., Holley, Mich
Bossert Corp., The, Utica, N. Y.
Crosby Co., The, Buffalo, N. Y.
Geuder, Paeschke & Frey Co. (Contract Mfg. Div.), Milwaukee.
Cuyahoga Spring Co., Cleve.
Lansing (Mich.) Stamping Co., So. Penn Ave.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Torrington (Ct.) Co.
Truscon Steel Co. Pressed Steel Div., Cleveland.
Worcester (Mass.) Stamped Metal Co.

METALS—Acid and Corrosion Resistant
Haynes Stellite Co., 30 East 42nd St., N. Y. C.

MILLING MACHINES—Automatic
Pratt & Whitney Co., Hartford, Conn.

MILLING MACHINES—Second Hand
Simmons Mch. Tool Corp., Albany, N. Y.

MILLING MACHINES—Universal
Brown & Sharpe Mfg. Co., Prov., R. I.

MILLING MACHINES—Vertical
Reed-Prentice Corp., Worcester, Mass.

MIXERS—Laboratory
National Engineering Co., Chicago.

MIXING MACHINES—Sand
Bartlett, C. O. & Snow Co., Cleveland.
National Engineering Co., Chicago.

MOLDING MACHINES—Jarring (Air)
Arcade Mfg. Co., Freeport, Ill.

MOLDING MACHINES—Rollover (Hand and Power Operated)
Arcade Mfg. Co., Freeport, Ill.

MONORAIL—Overhead
American Monorail Co., The, Cleveland.

MOTORS—Electric
Allis-Chalmers Mfg. Co., Milwaukee.

MOTORS—Electric, Second-Hand
Belyea Co., Inc., 147 W. 18th St., N. Y.
O'Brien Machinery Co., Philadelphia.

NAILS—Cut
Reading Iron Co., Philadelphia.

NAILS—Wire
Bethlehem (Pa.) Steel Company.

NITROGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.

NUT MAKING MACHINERY
Budd-Ranney Engineering Co., The, Columbus, Ohio.
National Mchry. Co., Tiffin, Ohio

NUTS—Acorn
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Castellated
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Cold Punched
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Hot Pressed
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Milled
Ferry Cap & Set Screw Co., Cleveland.

NUTS—Semi-Finished
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Thumb Malleable
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

ORES—Iron
Hanna Furnace Corp., The, Detroit, Mich.
Shenango Furnace Co., Pittsburgh.

OVENS—Baking
Young Bros. Co., Detroit.

OVENS—Coke and By-Product Recovery
Koppers Construction Co., The, Pittsburgh.

OVENS—Core and Mold
Crawford Oven Co., The, 203 Shelton Ave., New Haven, Conn.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
Holcroft & Co., Detroit.
Maehler, Paul, Co., The, Chicago.
Young Bros. Co., Detroit.

OVENS—Cross Regenerative
Koppers Construction Co., The, Ptgh.

OVENS—Drying
Crawford Oven Co., The, 203 Shelton Ave., New Haven, Conn.
Young Bros. Co., Detroit.

OVENS—Enameling and Japanning
Crawford Oven Co., The, 203 Shelton Ave., New Haven, Conn.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
Maehler, Paul, Co., The, Chicago.
Young Bros. Co., Detroit.

OVERHEAD CARRYING EQUIPMENT —See Monorail—Overhead

OXY-ACETYLENE — Shape-Cutting Machines
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

OXYGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

PACKING—Leather
Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.

PATENT ATTORNEYS
Boyle, John, Jr., Washington, D. C.

PERFORATED METAL
Harrington & King Perforating Co., Chi.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

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Greenpoint Iron & Pipe Co., Inc., 187-197 Maspeth Ave., Bklyn, N. Y.
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Metal Specialty Co., 1533 W. Sixth St., Cincinnati.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
Parish Pressed Steel Co., Reading, Pa.
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Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.

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Morgan Engineering Co., Alliance, O.

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Streine Tool & Mfg. Co., New Bremen, O.

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Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Hot and Cold Plate
Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.

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Lake Erie Engng. Corp., 68 Kenmore Sta., Buffalo, N. Y.
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Morgan Engineering Co., Alliance, O.
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PRESSES—Power
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New Albany (Ind.) Mch. Mfg. Co.
Niagara Machine & Tool Works, Buffalo, N. Y.
Pels, Henry, & Co., 90 West St., N. Y. C.
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Toledo (O.) Mach. & Tool Co.
V & O Press Co., Hudson, N. Y.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Roofing and Corrugating
Streine Tool & Mfg. Co., New Bremen, O.

PRESSES—Trimming
Toledo (O.) Mch. & Tool Co.

PULLEYS—Friction Clutch
Caldwell, W. E., Co., 260 Brandeis St., Louisville, Ky.

PULLEYS—Iron, Solid and Split
Caldwell, W. E., Co., 250 Brandeis St., Louisville, Ky.

PULLEYS—Magnetic
Magnetic Mfg. Co., 626 So. 28th St., Milwaukee, Wis.

PULVERIZERS
American Pulverizer Co., St. Louis, Mo.
Bartlett, C. O. & Snow Co., Cleveland.

PULVERIZERS—Coal
Bartlett, C. O. & Snow Co., Cleveland.

PUMPS—Centrifugal
De Laval Steam Turbine Co., Trenton, N. J.

PUMPS—Hydraulic
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Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.
Wood, R. D., Co., Philadelphia.

PUMPS—Rotary Positive
International-Stacey Corp., Columbus, O.
Paper & Textile Mchry. Co., The, Sandusky, Ohio.

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Marchant, Geo. F., Co., Chicago.

PUNCHING AND SHEARING MACHINES
Bertsch & Co., Cambridge City, Ind.
Pels, Henry, & Co., 90 West St., N. Y. C.
Ryerson, Jos. T., & Son, Inc., Chicago.
Thomas Spacing Mach. Co., Pitgh.

PURIFIERS—Oil.
De Laval Steam Turbine Co., Trenton, N. J.

PYROMETERS—Indicating
Bristol Co., Waterbury, Conn.

RAIL SPLICE BARS
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RAILS
Bethlehem (Pa.) Steel Company.
Frank, M. K., 220 East 42nd St., N. Y. C.
Illinois Steel Co., Chicago.
Inland Steel Co., Chicago.
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

RAILS—Relaying
Frank, M. K., 220 East 42nd St., N. Y. C.
Weiss, B. M., Philadelphia.

REAMERS—Adjustable and Expansion
Pratt & Whitney Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

REFRACTORIES—See Brick—Cement—Facing Clay and Fire Clay

REGULATORS—Compressed Gas
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

REINFORCEMENT FABRIC—Concrete
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

RIVET MAKING MACHINERY
Acme Machinery Co., Cleve.
Manville, E. J., Mach. Co., Waterbury, Ct.
National Mchry. Co., Tiffin, Ohio.

RIVET SETS
Marchant, Geo. F., Co., Chicago.

RIVETING MACHINES
Allen, John F., Co., 372 Gerard Ave., N.Y.C.
Shuster, F. B., Co., New Haven, Conn.
Wood, R. D., Co., Philadelphia.

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Bethlehem (Pa.) Steel Company.
Champion Rivet Co., Cleveland, Ohio.
Progressive Mfg. Co., Torrington, Conn.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., Chicago.

RODS—Drill
Globe Wire Company, Div. of the Firth-Sterling Steel Co., Sharpsburg, Pa.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.

RODS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

RODS—Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Haynes Stellite Co., 30 East 42nd St., N. Y. C.
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

RODS—Wire
Washburn Wire Co., Inc., 118th & Harlem River, N. Y. C.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

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Bliss, E. W., Co., 53rd St. and 2nd Ave., Brooklyn, N. Y.
Kane & Roach, Syracuse, N. Y.
Yoder Co., The, Cleveland.

ROLLING MACHINERY—Corrugating
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MACHINERY—Sheet Leveler
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MACHINERY—Sheet Metal
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MACHINERY—Sheet Oiling
Streine Tool & Mfg. Co., New Bremen, O.

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Demag Corp., Duisburg, Germany.
Hyde Park (Pa.) Fdry. & Mch. Co.
Mesta Machine Co., Pittsburgh.
Morgan Engng. Co., Alliance, Ohio.
National Roll & Fdry. Co., Avonmore, Pa.
Standard Machinery Co., Auburn, R. I.

ROLLS—Bending and Straightening
Bertsch & Co., Cambridge City, Ind.
Lake Erie Engng. Corp., 68 Kenmore Sta., Buffalo, N. Y.
Marshalltown (Iowa) Mfg. Co.
Niagara Machine & Tool Works, Buffalo, N. Y.

ROLLS—Brass, Bronze, Copper, Iron, Monel, Aluminum
Paper & Textile Mchry. Co., The, Sandusky, Ohio.

ROLLS—Sand Chilled Iron and Steel
Hyde Park (Pa.) Fdry. & Mach. Co.
Mesta Machine Co., Pittsburgh.
National Roll & Fdry. Co., Avonmore, Pa.

ROLLS—Special Hardened
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ROOFING AND SIDING—Corrugated and Plain
American Rolling Mill Co., Middletown, O.
Byers, A. M., Co., Pittsburgh.
Newport (Ky.) Rolling Mill Co.
Weirton (W. Va.) Steel Co.

ROOFING AND SIDING—Genuine Open Hearth Iron
Newport (Ky.) Rolling Mill Co.

ROOFING AND SIDING—Iron and Steel
Newport (Ky.) Rolling Mill Co.

ROOFING AND SIDING—Wrought Iron
Byers, A. M., Co., Pittsburgh.

ROOFING AND SIDING—(Zinc) Corrugated and Plain
New Jersey Zinc Sales Co., Inc., The., 160 Front St., N. Y. C.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
Parker Rust-Proof Co., 2186 Milwaukee Ave., Detroit.

RUST PROOFING
Parker Rust-Proof Co., 2186 Milwaukee Ave., Detroit.

RUST PROOFING COMPOUNDS
Parker Rust-Proof Co., 2186 Milwaukee Ave., Detroit.

RUST REMOVING
American Chemical Paint Co., Ambler, Pa.

SAND—Sand Blast
Cape May (N. J.) Sand Co.

SAND—Steel Molding
Cape May (N. J.) Sand Co.

SAND BLAST EQUIPMENT AND MACHINES
Arcade Mfg. Co., Freeport, Ill.
Mott Sand Blast Mfg. Co., Inc., Chi.

SAND BLAST STEEL SHOT
Pittsburgh (Pa.) Crushed Steel Co.

SAND CUTTING AND SCREENING MACHINES
Bartlett, C. O. & Snow Co., Cleveland.

SAND HANDLING EQUIPMENT
Bartlett, C. O. & Snow Co., Cleveland.
Hayward Co., The, 50 Church St., N. Y. C.
National Engineering Co., Chicago.

SAND MILLS
Bartlett, C. O. & Snow Co., Cleveland.
National Engineering Co. Chicago.

SAWING MACHINES—Metal
Earle Gear & Mch. Co., Phila.
Espen-Lucas Mach. Works, Phila.

SAWS—Band and Hack for Metal
Armstrong-Blum Mfg. Co., Chicago.

SCRAP—Iron and Steel
Perry, Buxton, Doane Co., Boston.

SCREENS—Perforated Metal
Harrington & King Perforating Co., Chi.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

SCREENS—Woven Wire
Cleveland (O.) Wire Cloth & Mfg. Co.
Michigan Wire Cloth Co., 2117 Howard St., Detroit
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

SCREW MACHINE PRODUCTS
Eastern Mch. Screw Corp., New Haven, Ct.
Ferry Cap & Set Screw Co., Cleveland.
Olson Mfg. Co., Worcester, Mass.
Ottemiller, Wm. H., Co., Inc., York, Pa
Progressive Mfg. Co., Torrington, Conn.
Screw Mch. Products Corp., Prov., R. I.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.

SCREW MACHINERY—Automatic
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Cone Automatic Mach. Co., Inc., Windsor, Vt.

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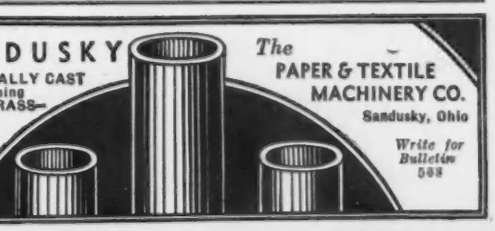

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Ottemiller, Wm. H., Co., Inc., York, Pa
Strong, Carlisle & Hammond Co., Cleve.

SCREWS, Socket, Head, Cap
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Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Thumb Malleable
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.

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Armel, James P., Pittsburgh.
Brotherhood, Percy M., & Son, 25 Church St., N. Y. C.
Knox, Karl E., Co., Erie, Pa.
Lucas, J. L., & Son, Inc., Bridgeport, Ct.
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Midland Steel & Equip. Co., Chicago, Ill.
Miles Mchry. Co., Saginaw, W. S., Mich.
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Monorail & Crane Exchange, P. O. Box 422, Cent. Sta., Toledo, Ohio.
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Randle Mchry. Co., 1772 Powers St., Cincinnati, Ohio.
Ross Power Equip. Co., Indianapolis.
Simmons Mch. Tool Corp., Albany, N. Y.
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Magnetic Mfg. Co., 626 South 28th St., Milwaukee.

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Union Drawn Steel Co., Beaver Falls, Pa.

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Union Drawn Steel Co., Beaver Falls, Pa.

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Union Drawn Steel Co., Beaver Falls, Pa.

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SHEARING MACHINES — Beam and Channel
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Weirton (W. Va.) Steel Co.

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Morgan Engineering Co., Alliance, O.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

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Demag Corp., Duisburg, Germany.
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Cleveland (O.) Wire Spring Co.
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Cuyahoga Spring Co., Cleve.
Fischer, Chas., Spring Co., 242 Kent Ave., Bklyn, N. Y.
Gibson, Wm. D., Co., Chicago.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Bklyn., N. Y.
Miller & Van Winkle, Inc., 18 Bridge St Bklyn, N. Y.
Washburn Wire Co., 118th St. & Harlem River, N. Y. C.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

SPROCKETS
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Cullman Wheel Co., 1339 Altgeld St., Chicago, Ill.

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Konigslow, Otto, Mfg. Co., Cleveland.
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Metal Specialty Co., 1533 W. Sixth St., Cincinnati.
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American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
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Latrobe (Pa.) Electric Steel Co.

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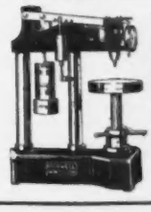

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Wolverine Tube Co., Detroit.

TUBING—Brass, Bronze, Copper, Monel, Aluminum (Centrifugally Cast)
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TUBING—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

TUBING—Seamless Steel
Keating, E. F., Co., 452 Water St., N. Y. C.
Midland Tube & Pipe Co., Bordentown, N. J.
Timken Roller Bearing Co., Canton, Ohio.

TUBING—Wrought Iron
Byers, A. M., Co., Pittsburgh.

TUMBLING BARRELS — See Barrels — Tumbling

TURBINES
De Laval Steam Turbine Co., Trenton, N. J.

TURBO-COMPRESSORS
Spencer Turbine Co., Hartford, Conn.

TURNTABLES
Canton (O.) Fdry. & Mch. Co.

TWIST DRILLS
Union Twist Drill Co., Athol, Mass.

UNIONS
Dart, E. M., Mfg. Co., Prov., R. I.

VALVES—Gas and Air Reversing
Swindell-Dressler Corp., Box 1753, Ptgh.

VALVES—Gas, Water and Steam
Wood, R. D., Co., Philadelphia.

VALVES—Hydraulic
Watson-Stillman Co., The, 103 Aldene Rd., Roselle, N. J.
Wood, R. D., Co., Philadelphia.

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Sheldon Machine Co., Chicago, Ill.

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Griffin Mfg. Co., Erie, Pa.
Wrought Washer Mfg. Co., Milwaukee.

WASHERS—Lock
Republic Steel Corp., Youngstown, Ohio.

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Ransohoff, N., Inc., Cinn., Ohio.

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Scaife, Wm. B., & Sons Co., Ptgh.

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Federal Mch. & Welder Co., Warren, O.

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Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

WELDING MACHINES—Butt
Federal Mch. & Welder Co., Warren, O.

WELDING MACHINES—Electric Arc
Federal Machine and Welder Co., Warren, Ohio.
General Electric Co., Schenectady, N. Y.

WELDING MACHINES — (Electric Arc) Second Hand
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Motor Repair & Mfg. Co., Cleveland.

WELDING MACHINES—Seam
Federal Mch. & Welder Co., Warren, O.

WELDING MACHINES—Spot
Federal Mch. & Welder Co., Warren, O.

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Bethlehem (Pa.) Steel Company.

WINCHES—Electric
Sprague Electric Hoists, Montour Falls, N. Y.

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Phosphor Bronze Smelting Co., Phila.

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Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Washburn Wire Co., Inc., 118th St. & Harlem River, N. Y. C.
Webb Wire Works, New Brunswick, N. J.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE—Insulated
Roebling's, John A., Sons Co., Trenton, N.J.

WIRE—Mattress
Roebling's, John A., Sons Co., Trenton, N.J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Netting
Cleveland (O.) Wire Cloth & Mfg. Co.
Roebling's, John A., Sons Co., Trenton, N.J.
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Webb Wire Works, New Brunswick, N. J.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

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Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Spring
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New England High Carbon Wire Co., Worcester, Mass.
Roebling's, John A., Sons Co., Trenton, N.J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Welding
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Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

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Michigan Wire Cloth Co., 2117 Howard St., Detroit, Mich.
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Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
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WIRE FORMING MACHINERY
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Manville, E. J., Mach. Co., Waterbury, Ct.
Nilson, A. H., Mach. Co., Bridgeport, Ct.

WIRE MILL MACHINERY AND EQUIPMENT
Shuster, F. B., Co., New Haven, Ct.

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Fischer, Chas., Spring Co., 242 Kent Ave., Brooklyn, N. Y.
Hindley Mfg. Co., Valley Falls, R. I.
Lee Spring Co., Inc., 30 Main St., B'klyn, N. Y.
Titchener, E. H., & Co., Binghamton, N. Y.
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Roebling's, John A., Sons Co., Trenton, N.J.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

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Roebling's, John A., Sons Co., Trenton, N. J.

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ZINC—Cold Rolled Strips
Platt Bros. & Co., The, Waterbury, Ct.

ZINC—Slab (Spelter)
New Jersey Zinc Sales Co., Inc., The, 160 Front St., N. Y. C.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . . PAGES 85-86

AN AID TO MODERNIZATION

The purchase of new and more efficient machinery or equipment at once brings up the problem of realizing on the replaced units—not always an easy matter.

But tell enough people about what you have to dispose of and your chances of finding a buyer somewhere are good. And of course the more people you tell, the more you sell.

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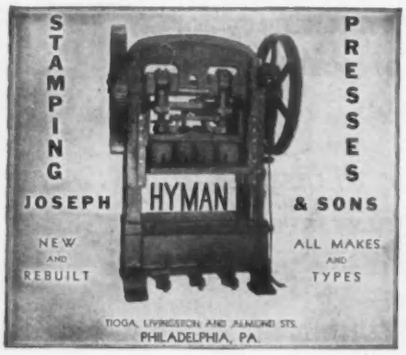

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10	700/2100	Triumph	26	Comp. Int.
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1—75/100	500/1800	Croc.-Wheeler	CMC-81H
1—60/100	475/950	Electro Dyn.	30-S
2—60/80	525/1050	Electro Dyn.	25-S
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2—40	300/900	Westgh.	SK-170
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1—25/33	275/825	Electro Dyn.	25-S
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...-SEVENTH YEAR OF SERVICE TO THE METAL WORKING INDUSTRY

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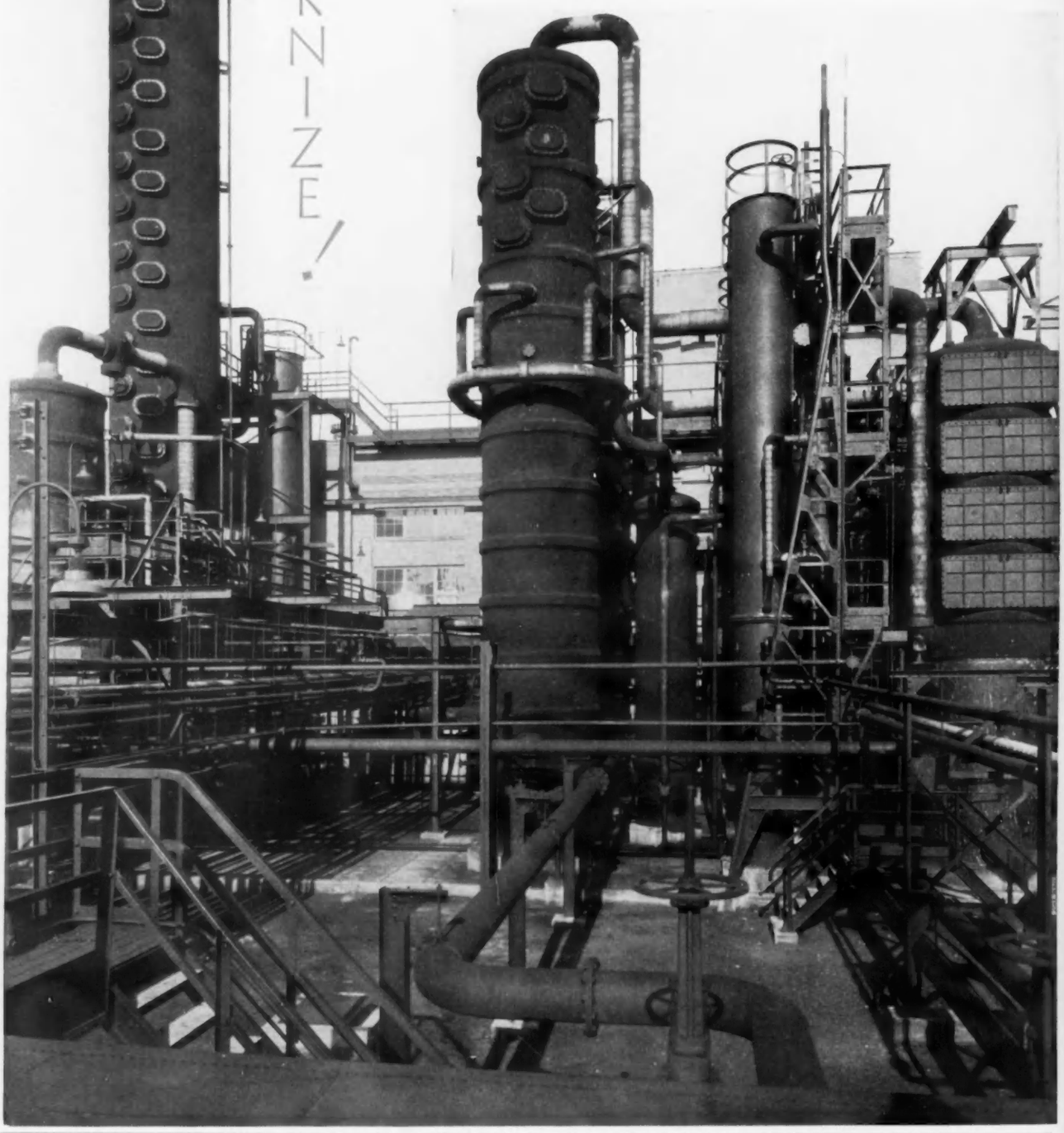

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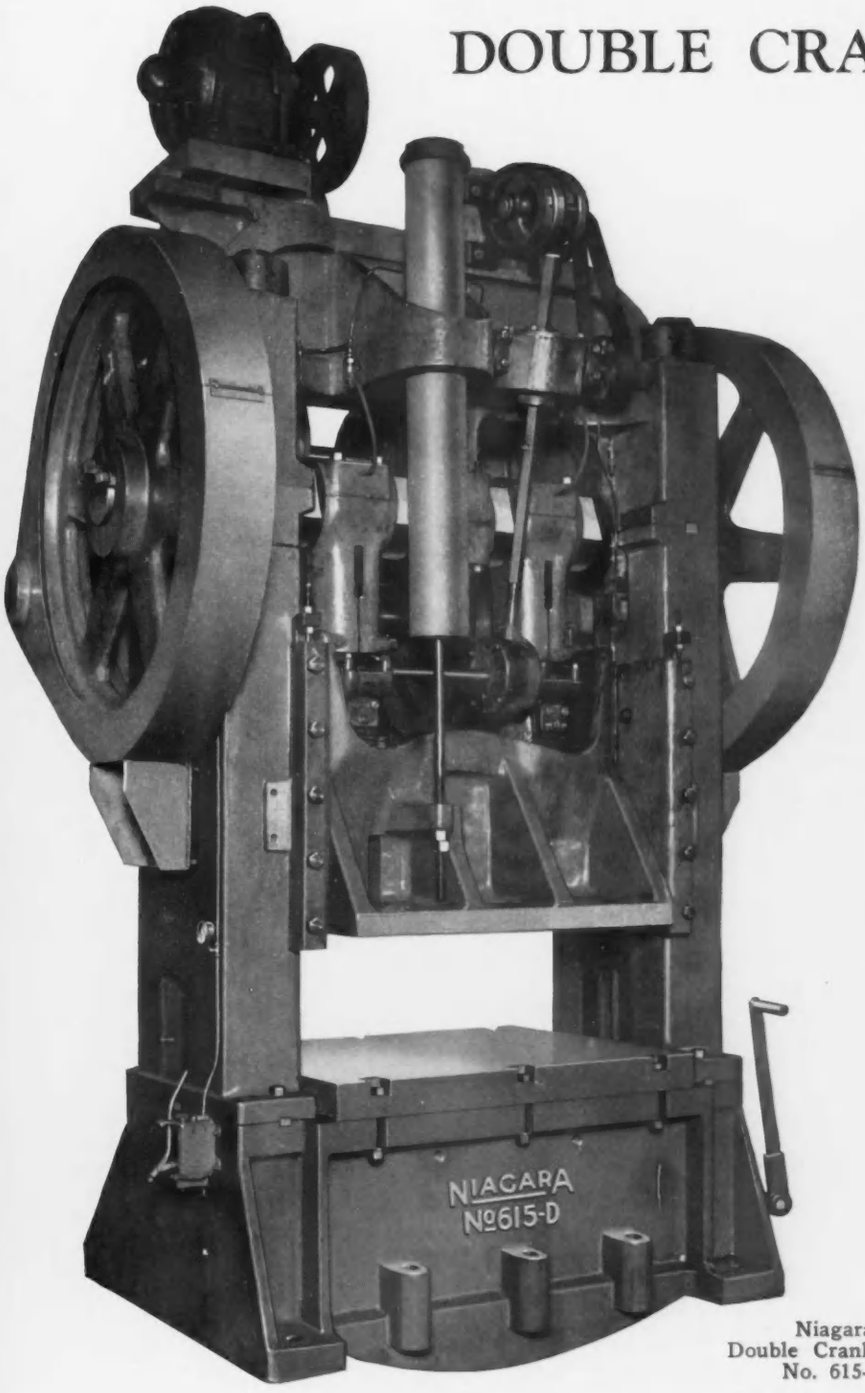

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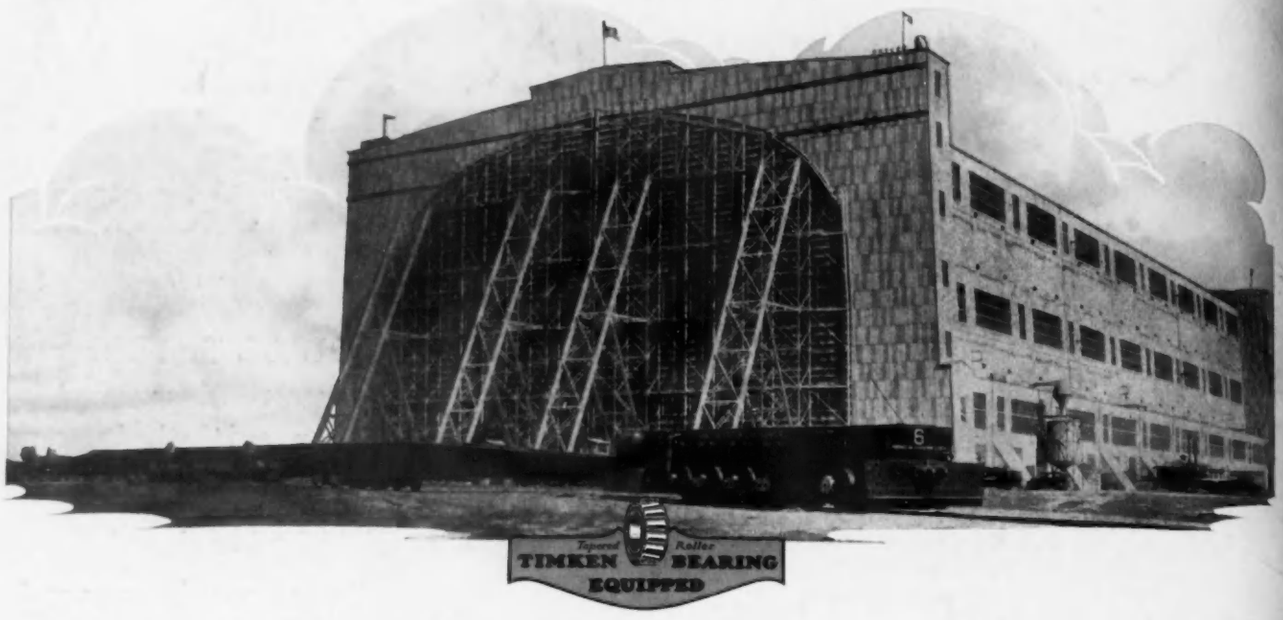

Unique Timken-equipped locomotive handles the Navy's giant dirigibles

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It was developed by the H. K. Porter Company, Pittsburgh, Pa., in accordance with the requirements of the Navy Department. The locomotive weighs 266,000 pounds and has a drawbar pull of over 60,000 pounds.

Power is provided by a 250 H.P. gasoline engine operating a hydraulic motor by means of which the final drive to the track wheels is accomplished.

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SEVENTH YEAR OF SERVICE TO THE METAL WORKING INDUSTRY

APR 14 1932

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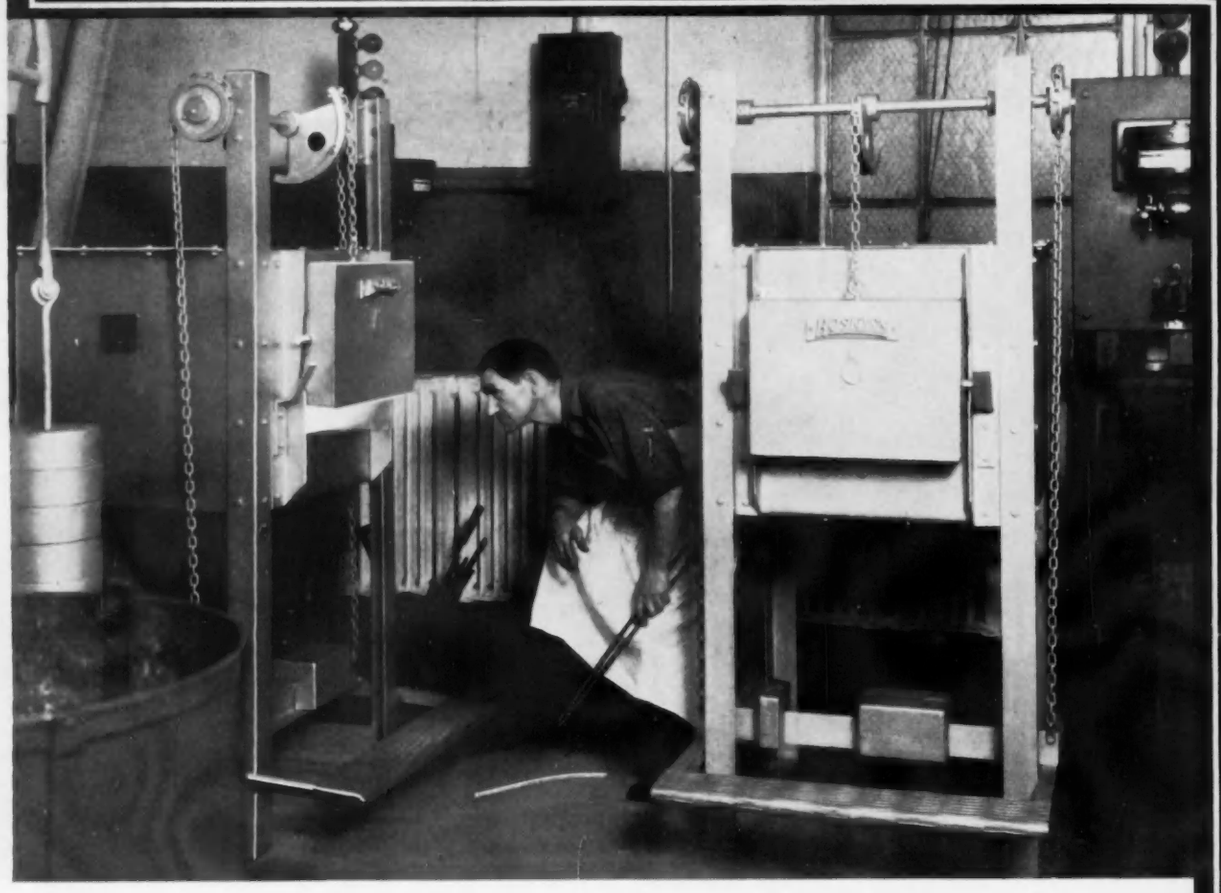

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THE IRON AGE .. April 7, 1932

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THE IRON AGE PUBLISHING COMPANY, 239 WEST 39th ST., NEW YORK

Division of United Business Publishers, Inc.

F. J. FRANK, *President* G. H. GRIFFITHS, *Secretary* C. S. BAUR, *General Advertising Manager*

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IRON AGE PUBLISHING CO.

Member, Audit Bureau of Circulations
Member, Associated Business Papers.

Published every Thursday. Subscription Price: United States and Possessions, Mexico, Cuba, $6.00; Canada, $8.50, including duty; Foreign, $12.00 a year. Single Copy 25 Cents.

Cable Address: "Ironage, N. Y."

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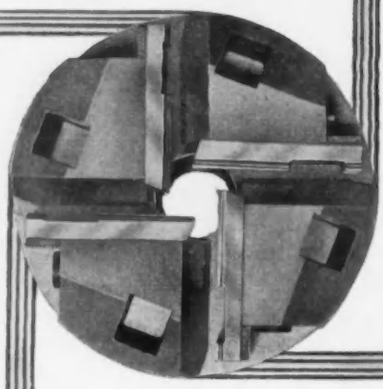

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..THE IRON AGE..

NEW YORK, APRIL 7, 1932

ESTABLISHED 1855 VOL. 129, No. 14

KENNETH B. LEWIS

WHAT IS AHEAD IN WIRE DRAWING

An Interview with Kenneth B. Lewis by W. W. Macon

A NOTEWORTHY contribution to the literature of wire drawing is this interview with Kenneth B. Lewis. It is a look into the near and far future. It carries with it implications of improvements in practice that are calculated to better the product and reduce its cost, all to the end of widening the field of wire applications.

The common wire rod may be over half again larger in diameter than the present one; the handling of heavier bundles will follow; mechanical handling will become general; present-day pickling and the subsequent baking may both be discontinued; a revolution portends in galvanizing, and marked changes in die design are likely. But there is a great need of much technical research. The interview is in part a call to the American industry to support such research.

WHAT of the future of the wire industry? Will there be many new uses found for wire and wire products? Will there be changes in present-day processes that are calculated to widen the market? Will there be improvements irrespective of a widening market?

There are two parts to the main question: the commercial and the technical. Certainly wire production, at least steel wire, has not expanded in the same ratio as other forms of steel, for the records of the past decade or so have shown that while the per capita consumption of wire has been increasing, the rate of increase is not up to that of steel in general.

As to expecting marked progress technically, the question was put to Kenneth B. Lewis, who is acknowledged as an expert of the first rank in wire manufacturing. He consented to give some answers, which are here set down. They present possibilities that may affect profoundly the economic and commercial position of the wire industry.

The authority with which Mr. Lewis speaks is based in part on the fact that since 1909 he has been concerned with the manufacture and sale of wire mill equipment for the Morgan Construction Co. of Worcester, Mass. Preceded by an engineering education at Harvard College, three years with the Bethlehem Steel Co., where he became assistant superintendent of the open-hearth department, and two years with the American Steel & Wire Co., at Worcester, as research engineer, he has devoted himself almost exclusively to the wire business. Fortified by trips abroad to the wire centers of Europe and with a penchant for historical as well as technical research, he has probably given more thought than any one else in this country to what we may have in store. As he himself expresses it, "The only sound basis on which to judge the future is the past."

Wire Rods Half Again Larger Than Present Size

POSSIBLY the most portentous change that Mr. Lewis thinks may come is the general use of a larger wire rod. The No. 5 rod, 0.207 in. in diameter, was selected many years ago as the point where the line was most economically drawn between hot rolling and cold drawing. This choice was predicated on

the then existing balance among power and labor costs, unit weights, die life, and other factors which have in recent years been profoundly modified. Now that the scope of continuous drawing has been extended, possibly a rod as large as 5/16 in. (0.3125 in.) in diameter may become the common starting point in drawing.

As Mr. Lewis puts it: "About half the output of the common products mill is one and two-draft wire from No. 5 rod. From a 5/16-in. rod this would be three and four-draft wire. In single-hole practice, the labor cost varies almost directly with the number of drafts. In continuous drawing, on the other hand, the number of drafts is of little consequence. The cost varies almost directly with the weight of the bundle.

Might Help the Nail Market

"Wire from No. 6 to No. 9½ gage," he continued, "if three and four-holed from a coarse rod, would be stiffer and might, by permitting the use of smaller diameters, put some life into the nail market. A keg of nails of a certain length would contain 60 to 70 per cent more nails by count.

"As for galvanizing, three and four-draft wire," he said, "would be cleaner and easier to cover. And as a raw material, the coarse rod would be more satisfactory. It would be easier and cheaper to clean, coat and bake, would take less acid and lime, be less susceptible to acid brittleness, and would run better off the flipper. It would take more power to draw, but less to roll. Bundles could be of double weight out of the same length of billet.

"Wire drawing labor costs would be about the same, the cost of extra drafts being balanced by savings due to larger bundles. Total power cost including both rod and wire mill would be greater but a big labor saving could be picked up in the rod mill where the same crew rolling a double section would turn out double the normal tonnage. A net saving of $1 to $1.50 a ton might be expected of the consolidated rod and wire mill practice. No. 5 rod might continue to be rolled for small gages of wire.

Heavier Wire Rod Bundles a Certainty

"In short," said Mr. Lewis, "the whole technique that has grown up around the No. 5 rod may have to be recast around another gage. At any rate we are certain to handle heavier bundles. In 1830, according to Deacon Washburn, in his autobiography, the daily output of a man on coarse wire was 50 lb.; today it is close to 20,000 lb., a 400-fold increase in 100 years. It is significant that the unit length of the wire rod has increased in the same period just 400 fold.

"Another significant thing," says Mr. Lewis, "is the growing interest in butt welding of rods for non-stop drawing on continuous wire machines. There is evidence that the Germans, the French and the Belgians are getting the jump on us in this development, which is the more humiliating for the fact that not only the idea but the very machines and welders and the dry drawing practice itself are American in origin."

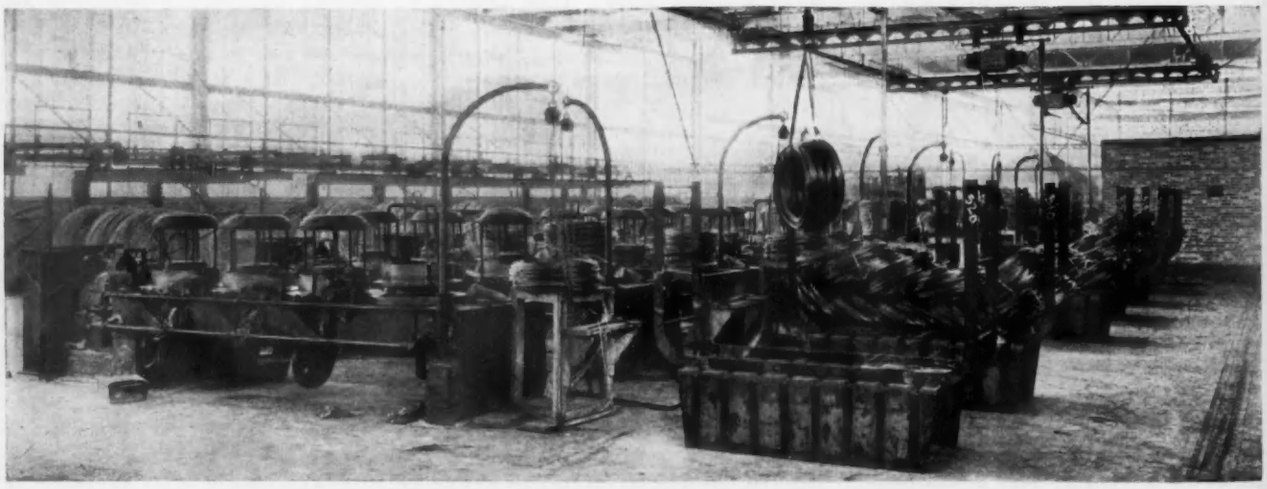
Advances Will Occur First in Design of Dies

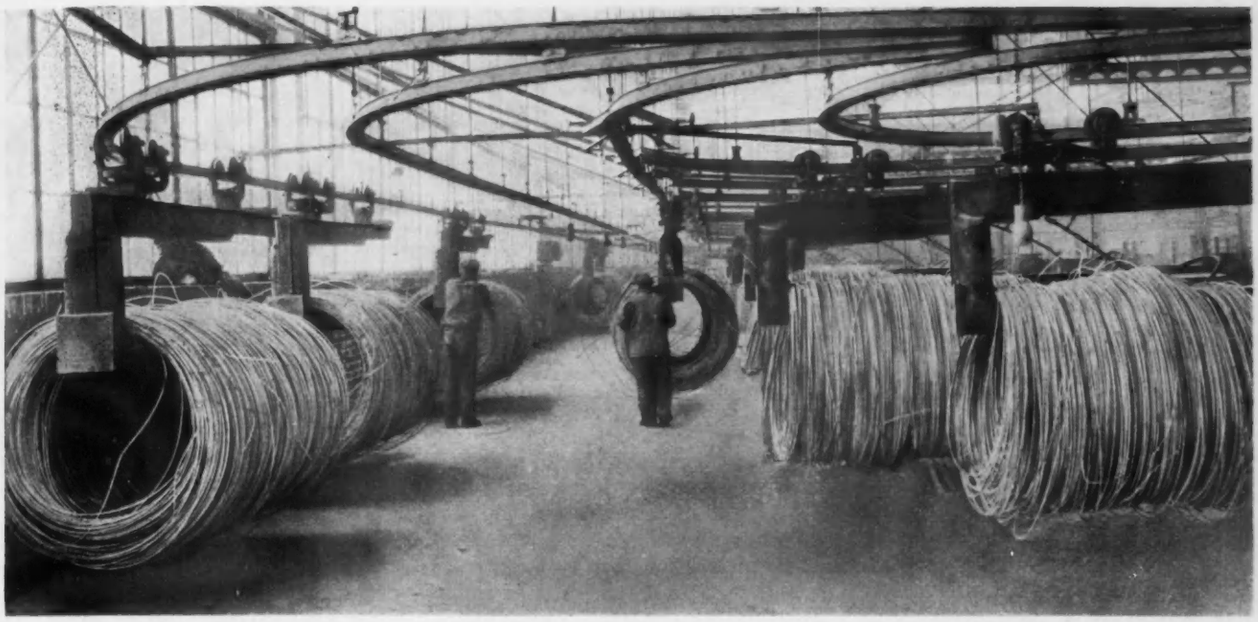
IF there is to be a saving in power and a heavier drafting of the wire, Mr. Lewis would look for it to come through some means by which the friction between wire and die can be reduced. He admits that steel of improved quality, free, for example, of segregation and solid non-metallic inclusions, might allow for larger cone angles in the die and thus for a larger percentage of the die pull to go into actual deformation of the metal. He states, however, that the results of recent researches are consistent with the view that beyond a certain point changes in die angle to decrease total friction are accompanied by an increase in the mean yield point of the metal in radial compression of such an order that one practically balances the other.

A sounder, cleaner steel would, however, in Mr. Lewis's opinion, permit of heavier drafts. "We are stressing the metal in the cone to its yield point in compression. The horizontal component of these radial compressive stresses, added to the frictional drag, must be exceeded by the tensile yield point of the finishing wire if drawing is to proceed. A flaw in the metal does not as a rule lower the yield point in compression, but it does in tension. Such a flaw will pass readily through the cone, but when it has to take up the burden of pulling subsequent metal through the die, it fails. We have to leave a substantial margin of safety for these flaws, and if they could be eliminated we could sail a little closer to the wind in laying out our drafting schedules."

Prophecy regarding dies is that within a few years "dies will be so far in advance of other details of the wire-making process that the die makers will have to sit down and wait for us to catch up with them." And at this point, Mr. Lewis delivered himself of a plea he has made at more than one engineering meeting, namely, that something be done to analyze the forces operating in a die, separating die pull into its component parts, that is, die friction and deforming force.

He has long sought for the for-





mulation of theories so that experiments may be planned along lines where success will count most. "Much patient work," he said, "is being done in the laboratories of England and Scotland, with which are associated the names of Longmuir, Adam, Brown, Thompson, Francis, Alkins, Desch, Bonn, Horsburgh and others. France and Germany are contributing to a discussion to which America not only fails to contribute but of which she fails even to take cognizance."

Tungsten Carbide Dies

Passing over briefly the matter of chilled iron dies, which Mr. Lewis urges are a good deal better than is generally supposed, and also tempered steel dies, which he credits with proving satisfactory when there has been the spirit to accept them, he dwelt a moment on tungsten carbide dies. He asserts there is no practical limit on the amount of wire that can be drawn in one threading. Yet he believes the tungsten carbide die is susceptible to improvement just as the tungsten filament for the electric light was changed from a delicate, fragile thing to one of notable toughness. As it is, these dies, he emphasizes, have a lower coefficient of friction than steel or cast iron and "they may be further improved by a higher polish, or a denser structure, again permitting heavier drafts.

"The factors limiting reduction are the yield point of the metal, the cotangent of the angle, and the coefficient of friction. The angle is of immense importance, but tampering with it for this purpose will, beyond a definite limit, defeat its object. The coefficient of friction, however, can be attacked with impunity. Every gain here will be net gain. Its importance will be apparent when one reflects that from 25 to 85 per cent of die pull is wasted in friction.

Tremendous Pressures Developed

"It is certain that after the invention of the die the greatest advance in the art was the discovery of a treatment whereby an unctuous substance could be bonded to iron wire so strongly as to persist as a substantial non-metallic film between die and wire. Friction was at once reduced to one-fifth the previous value, and the possible severity of drafting increased in about the same ratio.

"It must be remembered," said Mr. Lewis, "in extenuation of the seeming backwardness of the wire industry in this matter, that we are dealing with a bearing problem which would turn the hair of a power expert gray overnight. While the power and lubricating experts deal with pressures rising to 4000 or 5000 lb. per sq. in., our pressures begin at about 70,000 and run to 350,000 lb. Anything in the nature of fluid friction is out of the question; our problem relates to rigid films keyed to one of the co-acting surfaces and in our calculations the laws of unlubricated friction must be used.

"The weakness of our film lies in the fact that it thins out and disappears before the steel has had its full quota of cold work. Not only does it fall away on account of faulty bonding, but the mere change in wire size impairs it, since a reduction to one-half the original diameter means that the wire now presents twice the initial surface, which must be covered by the original film. The film bonded to the rod must carry on practically unaided, for it is very doubtful whether it picks up any help after the first draft. If only we could develop a film to which we could add as occasion arose, as do the European wire-drawers, our rejections would be cut enormously."

European Practice in Meeting Die Friction

Mr. Lewis referred here to the current European practice of coating rods by dipping in a solution of copper sulphate. The copper film so produced can be renewed by another dip whenever it shows signs of failure, and low carbon wire can be drawn an incredible number of drafts without failure. The copper film, however, makes direct contact with the die, and the frictional coefficient of the co-acting surfaces, he states, is more than double that of our practice, and light drafts, low speeds, and small unit weights are the penalties that must be paid for its use. The further fact that the leading European mills are adopting the American system seems to dispose of the copper film as a possibility.

Changes in Cleaning Wire Probable

CHANGES in the cleaning house of the wire mill we shall probably see, in the opinion of Mr. Lewis. We are trying to remove iron oxide from steel by a reagent, such as sulphuric acid, which does not act on the oxide, but does go to destroy the steel. The inhibitors in use are doing good work, he agreed; they ap-

(*Concluded on advertising page* 24)